THE IRON TRADE REVIEW

VOLUME XXX. CLEVELAND, O. AUGUST 19, 1897. CHICAGO, ILL. NUMBER 33.

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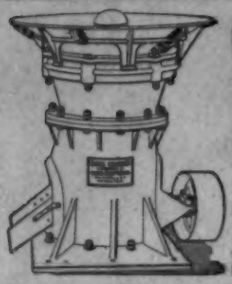

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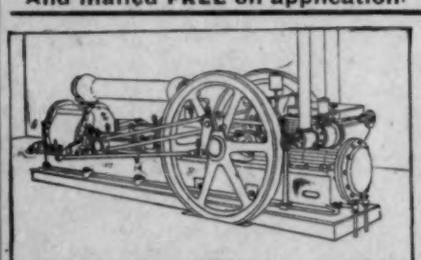

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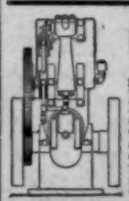

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THE IRON TRADE REVIEW

VOLUME XXX. CLEVELAND, O. AUGUST 19, 1897. CHICAGO, ILL. NUMBER 33

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

While not all that some impatient prophets of improvement have desired, the progress of the iron trade toward better conditions is still perceptible. It is significant that in July, a month always slack, the record of the two preceding months for a slight reduction in pig iron stocks was repeated, the July decrease being 26,000 tons for all kinds of iron. From what is known of the operations of steel works with connected furnaces, from which no reports of stocks are made, it is safe to say that the reduction in the supply of metal on hand was considerably more than the figures show. In the past week the reports of accumulating orders on the books of the mills were more numerous and more definite. One structural mill now has twice as much business ahead as at any time in two years. All structural works are unusually busy and those west of the Alleghenies have advanced their prices $2 a ton on ordinary business. No large orders have come up, however, to test the market seriously. Western iron mills, since the scale adjustment, have been getting gradually under way and most of them are busier to-day than at any time in the year. In the Chicago district some further car business is announced, and the agricultural contracts closed earlier are furnishing a steady tonnage. Chicago work in structural lines is promising, 7,000 tons being required for one contract for the elevation of tracks. In the Central West some agricultural requirements, usually filled in the fall, are about to come up. Outside of the advance noted above, prices of finished products have not changed; yet buyers have found in several instances that mills have taken a stand and are not making concessions that were common some weeks back. Pig iron production is increasing somewhat, a number of furnaces having started this month, while others will resume by Sept. 1. On Bessemer pig valley furnaces have established $9.25 as a minimum for deliveries in the last quarter and on deliveries extending through January an offer on that basis has been declined. Some pending business is likely to be closed at $9.25 for the balance of the year. In line with the better feeling in Bessemer pig, billets are held somewhat more firmly in the Pittsburg district, sellers quoting $14 to $14.25 at their mills. The Eastern market is stronger at $16.50 to $16.75, Philadelphia, with steel not plentiful for prompt delivery. The fact that some Wheeling district mills are stopped by scarcity of fuel and that steel plants in Pittsburg and the valley are well filled, makes sellers of billets confident of an advance. The market for foundry iron holds its own, with a trace of greater firmness in some markets. Gray forge has touched the lowest point, in the Pittsburg district, $8.25 being shaded. Mills in the valleys have bought at $8.10 delivered. An Ohio pipe works has covered its wants in gray forge at a figure close to $6, Birmingham.

THE CLEVELAND DISTRICT.

Ore sales have keep up at a good rate in the past week, Bessemer and non-Bessemer ores being about equally represented in the purchases. The larger selling interests have reached the amount of their allotments from the Bessemer Ore Association. The allotted total of all association ores was something over five million tons, including deliveries carried over from last year. Furnaces that have held off or covered only a portion of their wants have been in the market since Aug. 1. Non-Bessemer transactions are more difficult to trace and the prices at which these ores have sold lately are guarded to an unusual extent. The lake freight market is unchanged. Grain rates are easier and ore shippers have no trouble in getting wild tonnage at 50 cents to Lake Superior. Season business to Escanaba has been done at 50 cents in the week. In some cases shippers are getting to the end of their ore uncovered by contract and it would appear that but little over 2,000,000 tons of ore will move after Sept. 1.

Pig Iron. Inquiry for Bessemer iron is more active but few sales have been made in the week through Cleveland offices. Two Ohio steel companies are in the market for deliveries running beyond Jan. 1, one of them asking prices on 25,00 tons delivered in the first half of 1898. An offer of $9.35, delivered, equivalent to $9.25 at furnace, for October, November, December and January iron was declined by a Mahoning valley furnace, and Shenango valley steel works have set a $9.25 minimum for the fourth quarter, which would mean $9.50 delivered in the Mahoning valley. A largely attended conference of valley and Pittsburg iron manufacturers and railroad freight agents was held at Cresson Springs, Aug. 17, adjourned from Chautauqua, July 29. The request of the valley firms for the abolition of the 40 cents over Pittsburg freights, now paid on Eastern shipments from the valley was met with a request from Pittsburg for an equalization of rates on west-bound shipments. The railroad representatives favored a compromise rate, and another conference will be held next month. Haselton and Lowellville furnaces have gone in blast. In the Cleveland district both Central furnaces are active and River furnace has gone on foundry iron. The Newburg furnace of the Cleveland Rolling Mill Co. will probably remain inactive for a long time. Gray forge has sold at $8.10 delivered at valley mill. No. 2 foundry is $9 at furnace with most sellers, with demand light. We quote f. o. b., Cleveland:

Bessemer	$ 9 65	Valley Scotch No. 1	$10 40@10 65
No. 1 Strong Foundry	10 25@10 65	Valley Scotch No. 2	10 00@10 15
No. 2 Strong Foundry	9 65@10 15	Gray Forge	8 65@ 8 75
No. 3 Foundry	9 25@ 9 50	Lake Superior Charcoal	12 25@12 75

Finished Material. Structural mills represented in Cleveland have advanced quotations $2 a ton on beams, channels and angles, and on small business in beams and channels now ask 1.10c, Pittsburg, with 1.05c possible on large orders. A new train shed for the Cleveland & Valley Terminal Road, calling for 600 tons, is to be let this week and a freight depot extension involves 150 tons more. Boiler and tank work is more active and several plate inquiries are reported. Plate mills are better filled, but prices have not advanced. Some good business in merchant steel, particularly tire, has been closed and prices are found less elastic than in recent weeks. The Union Rolling Mill is still idle, but will soon start. Valley mills in general are busy on accumulated orders. Some agricultural business involving special section steel is pending. Nail and wire mills are busy. Wire nails are selling at $1.25 at mill and wire at $1.05. Some inquiries are out for wire rods, and Cleveland quotations are $19 to $19.50.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1142 MONADNOCK BLOCK, Aug. 18.

The actual business of the week was not a great deal larger than that of the week preceding, but the sentiment among dealers was much more hopeful, and the prospects for the future appear to brighten all the time. The larger part of the business in prospect in this district will go to the structural mills, as two or three very large contracts are coming up soon. The largest of these is for the material for the track elevation of the Pennsylvania road, part of which probably will be let this week. This part will amount to about 7,000 tons. Further material for this work will have to be placed, but it is not likely that any more will be needed this season. In fact it is doubtful if the first of the work will be commenced before next fall. An inquiry has been received from Japan for 4,000 tons of bridge material for the Nippon Railway, and this is being figured on by Chicago bridge builders. The local mills report a good business in steel, and that specifications on old contracts are being made with gratifying promptness. The Northern pig iron dealers also say that trade has been very good, and that deliveries are better than for some time. The coal strike apparently has not affected the iron business here at all, or at most very little, as none of the important concerns have suffered from a shortage of fuel. The plants of the Illinois Steel Co. were put on oil some time ago, to save coal, and are still burning oil.

PIG IRON.—Business with the local furnaces last week was very good. None of the orders taken were large, the largest probably being not over 1,000 tons, but the aggregate tonnage closed was quite satisfactory. There are several encouraging features about the trading done. A number of the buyers were not expected to come into the market this month, as they had placed contracts some months ago that the furnaces thought would last them for a time beyond this; but the foundries found that their own business was large enough to more than use the iron they had bought. The buying was well scattered over the territory, and some of it came from concerns that had not been in the market before for a long time, and that had almost been lost sight of. The future business looks better now than it has for months, and the furnaces are expecting the present good business to keep up. Deliveries with the leading interest were larger last week than for over a year before, and it is expected that they will keep up. The Mayville furnace will be put in blast some time this week, making soft iron, to compete with Southern. The Southern iron dealers do not report such an encouraging state of affairs. Their sales last week were small, and the inquiries in hand are not very large. Prices of both Northern and Southern furnaces are being well maintained.

Lake Sup. Charcoal	$13 00@13 25	South'n Coke No. 3	9 60@ 9 85
Local Coke Fdy. No. 1	10 50@10 75	Southern No. 1 Soft	$10 35@10 60
Local Coke Fdy. No. 2	10 25@10 50	Southern No. 2 Soft	9 85@10 35
Local Coke Fdy. No. 3	10 00@10 25	South'n Silveries	10 35@10 60
Local Scotch Fdy. No. 1	10 50@10 75	Jackson Co. Silveries	12 50@14 50
Local Scotch Fdy. No. 2	10 25@10 50	Ohio Strong Softeners	12 00@12 25
Local Scotch Fdy. No. 3	10 00@10 25	Alabama Car Wheel	15 50@16 00
South'n Coke No. 1	10 75@11 00	Malleable Bessemer	10 75@11 00
South'n Coke No. 2	9 85@10 10	Coke Bessemer	11 50@12 00

BARS.—Further orders for cars have been placed in this market by some of the Western roads in the week. The M., K. & T. has ordered 1,000 cars, which will be built in St. Louis. The Gulf road has bought 600 cars, and several orders for smaller lots have been placed. Other lots are being figured upon, and these will be placed soon. The material for these cars has been bought, or will be placed soon, and is giving considerable of an impetus to the bar iron trade. The tonnage closed last week was very satisfactory, and included several round lots. General business in small lots is better, and altogether the business is in much better shape than it was two or three weeks ago. The Sylvan Steel Co., of Moline, Ill., will start up its plant this week. Prices are unchanged, and are inclined to be firmer. Quotations are made at 1.10c to 1.20c for both common iron and steel bars from strictly billet stock, and 1.20c and up for guaranteed iron.

RAILS AND TRACK SUPPLIES.—In this branch of the market there has been no change. The local mills report a fair week's business, with no large lots closed. Quotations are made: Rails, $19 to $21, according to specifications; steel splice bars, 1.20c to 1.30c; track bolts with square nuts, 1.80c to 1.90c; hexagon nuts, 1.90c to 2c; spikes, 1.55c to 1.60c.

BILLETS AND RODS.—There is a much better inquiry, and prices are much firmer than they were a week ago. Sales last week did not include any large lots, but were satisfactory. Quotations are made at $15 for billets and $21 for rods.

STRUCTURAL MATERIAL.—The largest business in this market at present is the contract for the track elevation of the Pennsylvania road, which will take about 7,000 tons, and which is expected to be let this week. Bids were opened on Tuesday. An inquiry has been received for about 4,000 tons of material for bridge work from the Nippon Railway, of Japan. This is being figured upon by several Chicago contractors. The Madison, Wis., library building, amounting to 700 tons, was finally closed last week. No other large contracts were let, or came up, but others are in prospect, and will be heard of soon. The market has been very firm, and one or two of the mills have advanced quotations somewhat. Quotations are made as follows: Beams and channels, 1.15c to 1.20c; angles, 1.10c to 1.15c; plates, 1.10c to 1.15c; tees, 1.30c to 1.40c. Small lots from stock are quoted one-quarter to one-half cent higher.

PLATES.—While last week's business did not include any large sales, the tonnage closed was very good, and the inquiries in hand denote a continuance of a good trade for some time. The local mills are running full all the time. Quotations are very firm as follows: Tank steel, 1.10c to 1.20c; flange steel, 1.30c to 1.35c, fire-box steel, 1.85c to 5c.

SHEETS.—The demand has not been very large, but has been fair, and appears to be improving slightly. Sales last week were not large, but were very satisfactory. Quotations are made at 1.90c to 2c for No. 27 black, and 80 and 5 to 80 and 10 per cent discount for galvanized.

MERCHANT STEEL.—Both store and mill business was good last week, and several good sized contracts were closed. The demand keeps up well, and future business is expected to be good. Quotations are as follows: Open-hearth spring, tire and machinery steel, 1.60c to 1.70c; smooth finished machinery steel, 1.50c to 1.55c; smooth finished tire, 1.35c to 1.40c; tool steel, 5.50c to 7.50c; specials, 11c and upwards.

SCRAP.—Not very much was done last week. The demand is light, and dealers do not look for much business right away, although they are hopeful of the early fall. The quotations below represent dealer's asking prices for old material: Old iron rails, gross ton, $11.25 to $11.50; old steel rails, gross ton, $7 to $7.50; old wheels, gross ton, $10 to $10.25; railroad forge, net ton, $10.50 to $11; dealer's forge, net ton, $9 to $9.50; No. 1 mill, net ton, $7.50 to $8; heavy cast, net ton, $7.50 to $7.75; malleable cast, net ton, $8 to $8.50; axles, net ton, $13.50 to $14; cast borings, net ton, $2.75; wrought turnings, net ton, $4 to $4.50; axle turnings, net ton, $5.50 to $6; mixed steel, heavy, gross ton, $6.25; stove plates, net ton, $5.50 to $6; heavy melting steel, gross ton, $7 to $7.50; old iron splice bars, gross ton, $11 to $11.25.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
807 TRADESMEN'S BUILDING, Aug. 18.

Higher prices are holding on skelp, muck bar, tin bars, bar iron and certain gauges of sheets. In each case, however, the advance results from decreased mill capacity resulting from the coal famine. One local mill is asking higher prices for angles, sheets and steel bars, as a result of comfortably filled order books, but this condition is by no means general and the week offers no better prices for rolled products. The volume of finished material business continues strong. In pig iron Bessemer is only in demand for 1898 deliveries and for delivery through the four months ending with January, while gray forge is said to have touched the lowest figure at which it ever sold in Pittsburg. The coal strike is becoming serious and the Wheeling district is practically idle as a result. Pittsburg is but little affected thus far.

PIG IRON.—Bessemer for deliveries into next year would be easily marketable just now were furnaces in a selling mood. Larger consumers are seeking such deliveries and are offering higher prices. The largest inquiry of the sort now current is that of a Northern Ohio interest for 25,000 tons covering the first five months of 1898. In actual business a sale of 4,000 tons of Bessemer for last quarter delivery, made at $9.25, valley, fairly indicates existing conditions. On a 1,000-ton lot of gray forge the lowest price ever recorded on gray forge in this market is said to have been touched. Other sales of gray forge are authenticated at $8.25 and $8.30, Pittsburg,

but none of any consequence in foundry irons. Prices on both prompt and future deliveries of Bessemer are stiffer than a week ago. Quotations are made as follows for immediate delivery:

Bessemer at valley furnace	$9.00 to $9.10
Bessemer delivered Pittsburg District	9.40 to 9.50
No. 1 Foundry	10.25 to 10.50
No. 2 Foundry	9.25 to 9.65
No. 3 Foundry	9.00 to 9.25
Gray Forge	8.25 to 8.75

BILLETS AND SHEET BARS.—Sheet and tin bars are higher and moderately scarce. In the Wheeling district the coal famine has assumed serious proportions, shutting down mills and closing this source of supply. Bellaire cannot roll before the middle of September, the Mahoning valley interest is booked ahead and Pittsburg is also well filled. Quotations are made at $16.35 to $16.65, Pittsburg delivery for prompt business. Billets for future shipment are slightly higher. For prompt deliveries $14 to $14.25 is quoted. A lot of 1,000 tons for September delivery brought $14.05, Pittsburg. The steel goes last, Pittsburg or Wheeling shipment being at seller's option.

STRUCTURAL MATERIAL.—One of the two Pittsburg structural mills has advanced on all shapes except beams. The tonnage now booked in this mill is said to be double that on the books at any time in the last two years. Eastern Pennsylvania mills are full up on fitted work but are quoting on plain material. A 4,000-ton inquiry for a Japanese bridge contract is being figured on by local mills. On beams 1c is possible and 1.05c to 1.10c is quoted. On angles and plates 1.05c is minimum with certain mills, while those with larger capacity are taking the business at hand at recent quotations. Tees and zees are quoted at 1.20c to 1.30c.

PIPES AND TUBES.—The second ten miles of the 60 miles of 6-inch pipe for shipment to Germany is now up. The first ten miles has already been shipped by the Pennsylvania Tube Works. The merchant pipe trade is steadily expanding and quoted prices are demanded. Discounts are made as follows: Merchant black, 57 and 67 per cent off; galvanized, 52 to 55 per cent off; six tens for less than carload lots, six tens and two and a half per cent on carload lots. On merchant boiler tubes we quote: Two and a quarter inch and smaller, 75 per cent discount; two and a half inches and over, 75 and 10 per cent discount. The following quotations on casing are firmly maintained: Screw and socket joint, 62½ per cent discount; inserted joint, 57½ per cent discount.

TIN PLATE.—Prompt plates have been difficult to find in the week and in several cases requirements remain uncovered. On 100-lb. coke plates $3 is asked, where material can be had. Deliveries ahead are being generally negotiated at prices but little ahead of to-day's basis.

SHEETS.—The wants of corrugating works have resulted in some heavy business in the last few days. Mills in the Wheeling district are either idle or operating under difficulties, on account of scarcity of coal. In consequence the recent famine of sheets for prompt delivery is intensified and certain gauges cannot be had at all. Notwithstanding this fact, prices on the prompt material available are not higher. Black sheets are quoted: No. 26, 1.80c to 1.85c; No. 27, 1.85c to 1.90c; No. 28, 1.90c to 1.95c. Galvanized sheets are quoted at 80 and 10 per cent off list. For future deliveries all sheets are firmer.

BARS.—The capacity of Pittsburg mills on steel bars is so well taken that at least two mills have stiffened quotations and now ask 1c as minimum. In common iron, valley mills have closed some good contracts and increasing sales are reported of the branded Pittsburg muck bar iron. Valley quotations on common iron are 90c to 1c; Pittsburg, 1c to 1.10c; branded muck bar irons, 1.25c and upwards. A 1,500-ton lot of neutral muck bar for immediate shipment brought $18.25, Pittsburg.

RAILROAD AND TRACK MATERIAL.—Relaying rails and light sections of new rails are wanted just now. Track material is holding firmer to prices asked. Quotations follow: Splice bars, 1.10c to 1.15c; track bolts, iron, 1.65c to 1.70c; steel spikes, 1.45c to 1.55c. Links and pins are quoted at 1.20c to 1.25c.

MERCHANT STEEL—Demand for branded tool steel is heavier. A general increase of tonnage is reported. We quote: Open-hearth spring, 1.35c to 1.40c; open-hearth machinery, 1.15c to 1.20c; machine-straightened tire, 1.25c to 1.30c; soft steel bars, 1.25c; toe calk, 1.35c to 1.40c; sleigh shoe, 1.25c; tool steel, ordinary, 5c to 7c; branded, 10c and upwards.

IRON AND STEEL SKELP.—The coal scarcity by closing at least three skelp mills has caused a better market for skelp. Pipe mills, anxious regarding the future, have shown eagerness to cover. Two lots of grooved iron skelp of 1,000 tons each were taken and for the second lot a higher price was paid than for the first. Another sale of 1,500 tons is reported, and a number of smaller lots. Quotations are made as follows: Grooved steel skelp, 92½ to 95c; sheared steel skelp, 1.02½c to 1.05c; groved iron skelp, 1.05c to 1.07½c; sheared iron skelp, 1.20c to 1.25c; four months, or two per cent off for cash, 30 days.

FERRO-MANGANESE.—Domestic, 80 per cent, is quoted at $45 to $45.50.

OLD MATERIAL.—Both iron and steel rails had an active week. Of the former one lot of 1,000 tons sold at $11.50 gross here, another of 200 tons at $11.75 gross. A 1,000 ton sale of steel gross rails was made at $9.25 and another of 500 tons is reported at $9.45 gross. Other prices made in the week were: No. 1 wrought, $11 gross; cast scrap, $8.35 gross; cast borings, $5.25 gross; car wheels, $8.25 gross. A sale of 500 tons of car wheels was made at the price quoted.

IN OTHER MARKETS.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Philadelphia

The situation shows continued improvement, and while there is no indication that changes will come rapidly, so as to show distinctly from week to week, the gradual increase in the volume of business is a matter of general testimony. The mills are filling up, and the admission is made by buyers that the bottom has been reached—not in so many words, but by placing orders at quoted figures after attempting for a week or ten days to get concessions. This is a sign of betterment that cannot be mistaken. The increased demand is not so plainly recognizable in pig iron as in finished forms of material; yet sellers of iron are a little more inclined to hold to quoted rates and there is somewhat more inquiry. The situation as to pig iron stocks is slightly improved. The following quotations rule, with 25 to 50 cents less possible on deliveries at points in Eastern and Southeastern Pennsylvania: No. 1x foundry, $11.75 to $12.50; No. 2, $10.75 to $11.25; No. 2 plain, $10.25 to $10.50; standard mill irons, $10 to $10.25; ordinary mill irons, $9.50 to $9.75; basic iron, $10.50 to $10.75. Considerable inquiry is noticed for billets and prompt steel is firmer and not plentiful. On immediate delivery $16.50 is the quotation and on forward delivery $16.75. The mills have taken some good orders for finished products the past week and buyers have been disappointed in some instances in not getting the concessions they thought it possible to obtain. Order books are better filled than in a number of weeks and sellers are more confident. We do not hear of any advance actually obtained, however. Quotations are made as follows: Refined bars, 1.07½c to 1.12½c; special bars, 1.20c to 1.25c; soft steel bars, 1.10c to 1.15c; plates, 1.10c to 1.15c; angles, 1.10c to 1.20c; beams, 1.25c to 1.40c.

Buffalo.

A steady run of small business in amounts of 100 and 200-ton lots with a few reported sales of 1,000 tons each, make up the week's business in this territory. The smaller orders are mostly for prompt shipment. Owing to this and to the call for shipment on orders placed some time ago, the stocks at furnaces in this district continue to decrease. There is sharp competition for every order placed. The general feeling is that foundrymen have a little more work and are hopeful of a gradual improvement in business from now on. We quote below on the cash basis, f. o. b. cars at Buffalo: No. 1 strong foundry coke iron, $10.50; No. 2, $10; Ohio strong softener, No. 1, $10.50; Ohio strong softener, No. 2, $10; Jackson county silvery, No. 1, $14; Southern soft, No. 1, $10.75; No. 2, $10.50.

THE oldest silica fire brick plant in the country is the Diamond Fire Brick Works, located at Akron, O. Its Diamond fire brick have been in steady demand in the past 30 years, particularly among rolling mills and steel works in the Central West. Hon. J. Park Alexander, the founder of the business and still identified with it, has been a member of the Ohio House, and served two terms in the Senate. The present manager, Mr. Henry B. Sperry, is maintaining well the reputation of the Diamond brick for durability.

THE IRON TRADE REVIEW

DEVOTED TO IRON AND STEEL MANUFACTURE, FOUNDRY AND MACHINERY TRADES.

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IRON AND STEEL TRADE BALANCE.

To the average manufacturer of iron and steel the columns of statistics issued by the Statistical Bureau of the Treasury Department are dry reading. But we are sure the iron and steel exhibits are being followed with more than ordinary interest just now, when iron manufacturers want accurate information and not roundabout rumors as to the progress actually making in outside markets. We have presented these figures from time to time because of the general demand for them among our readers; and on this occasion the supply of figures is larger than usual because the reports just issued make possible a summation of the first complete 12 months in which a serious effort has been made by any considerable number of American manufacturers of machinery and of the products of blast furnaces and steel works, to establish a foreign trade. The table below shows how pronounced the increase of exports has been in certain lines:

IRON AND STEEL EXPORTS FROM UNITED STATES IN THE YEARS ENDING JUNE 30, 1896 AND 1897, WITH VALUES FOR THREE YEARS.

	Gross tons. 1897.	Gross tons. 1896.	Value. 1897.	Value. 1896.	Value. 1895.
Scrap	16,566	1,172	$ 193,503	$ 11,389	$.....
Pig iron	168,890	29,862	2,331,771	471,803	277,066
Band and hoop iron	384	222	16,984	9,675	6,411
Bar iron	3466	3,523	126,646	175,099	143,221
Car wheels—No.	18,548	14,635	112,187	104,215	140,010
Castings, n. e. s.	.....	.....	989,432	794,314	582,988
Cutlery	.....	.....	178,381	188,466	154,410
Firearms	.....	.....	644,992	770,852	786,903
Steel ingots, bars, etc.	41,293	2,673	1,121,090	125,151	95,471
Builders' hardware	.....	.....	4,152,836	3,311,738	2,483,666
Saws and tools	.....	.....	2,474,630	2,197,450	1,984,612
Machinery, n. e. s.	.....	.....	21,224,973	14,853,221	11,493,093
Fire engines—No.	2	5	6,790	10,645	9,010
Locomotive engines—No.	338	251	3,225,831	2,512,270	2,379,519
Stationary engines—No.	433	324	323,438	216,991	220,375
Boilers, engine parts	.....	.....	671,334	534,001	376,325
Cut nails and spikes	11,373	9,255	519,471	428,630	283,646
Wire nails, tacks, etc.	4,438	3,586	357,541	321,055	210,192
Iron plates and sheets	1,906	488	92,332	34,043	52,936
Steel " " "	2,497	807	118,965	53,291	65,600
Printing presses	.....	.....	649,710	348,053	159,627
Rails, iron	4,181	5,382	79,488	115,571	43,090
Rails, steel	107,891	22,263	2,482,208	540,797	267,400
Scales and balances	.....	.....	381,886	416,471	292,918
Sewing machines	.....	.....	3,340,241	3,139,249	2,260,139
Stoves and ranges	.....	.....	325,625	320,659	248,199
Wire	48,093	31,664	2,242,617	1,506,885	1,277,479
Other m'f'res iron and steel	.....	.....	9,112,403	7,647,438	5,706,668
			$57,497,305	$41,159,442	$32,000,989

We have called attention from time to time to the growing movement abroad, of our iron and steel products, particularly pig iron, ingots and bars, and steel rails, and no extended comment is necessary at this time, more than to call attention to the large contributions made by these products to the increase in values.

Machinery exports, apart from sewing machines, which reached practically the same figure in both years, increased over 40 per cent the past year over the one preceding—the total value being $26,102,076 against $18,127,128. This is not surprising in view of what we have been hearing from the machinery trade through the year. Furthermore, some American tool builders have been careful not to make public the extent of their foreign business, so large and profitable has it become. Europe was our best customer, taking $15,200,019 worth of our machinery last year, while in the preceding year the total was $9,319,319. The United Kingdom took $7,248,137 worth last year and Germany $2,918,959 worth. "Other Asia and Oceanica" (leaving out China, British Australasia and the East Indies), increased their trade in our machinery from $1,066,935 in 1896 to $2,390,417 last year; Africa from $1,308,380 to $1,578,335; Mexico from $2,455,400 to $2,874,283. Brazil fell off from $1,201,415 to $769,631.

The year's summary of imports of iron and steel is gratifying in that the record of decrease here is as decided as that of increase in the case of exports. The tonnage of imports in the year ending June 30 last was only 196,286, as against 369,585 in the preceding year and 324,077 tons in the year ending June 30, 1895. We place side by side in the following table the figures under each head for the three years, making it possible to note the lines in which the decrease has been most pronounced. The figures for tin plate fit in well with the statement made in the discussion on that industry at the Cardiff meeting of the Iron and Steel Institute two weeks ago. It was admitted there that Welsh works were losing the American trade entirely, except the oil-canning trade, on which the duty is rebated, and one speaker referred to the Dingley bill as putting the last nail in the tin plate trade with the United States, for final consumption here—a recognition of the fact that the advanced duty has given the Pacific Coast trade to American tin plate mills. Another notable decline is in pig iron imports. The boom of 1895 brought in a good deal of foreign spiegel in the first half of the fiscal year ending June 30, 1896:

IRON AND STEEL IMPORTS IN THE THREE YEARS ENDING JUNE 30, 1895, 1896, 1897.—GROSS TONS.

	1897.	1896.	1895.
Pig iron	22,159	88,125	14,174
Scrap iron and steel	3,410	10,747	2,098
Bar iron	13,459	21,830	12,926
Iron and Steel Rails	7,777	1,056	784
Hoop and band iron	2	39	173
Ingots, blooms, etc	17,661	30,720	13,441
Sheets and plates	4,220	10,065	25,130
Cotton ties	7,261	3,485	5
Tin plates	102,711	171,937	226,803
Wire rods	14,801	26,864	22,996
Wire	2,825	4,717	5,547
	196,286	369,585	324,077

The value of imports of iron and steel in the year was $16,096,681 as against $25,338,103 in the fiscal year 1896 and 23,048,515 in 1895. Iron ore imports, whose value is not included in the above, were 543,241 tons the past year, as against 776,283 the previ-

ous year and 262,205 in the year ending June 30, 1895.

As indicating how the balance of trade in iron and steel, as between the United States and the outside world, has changed in the past few years, we give a statement for five years, beginning with the year ending June 30, 1893, the last year in which our iron and steel imports were greater than our exports. In that year we brought in $17,565,640 worth of tin plates, as against $5,344,638 worth last year:

IRON AND STEEL IMPORTS AND EXPORTS OF THE UNITED STATES.

Fiscal year.	Imports.	Exports.	Excess.
1893	$34,450,734	$30,106,482	Imp. $4,344,252
1894	20,594,373	29,214,393	Exp. 8,620,020
1895	23,048,515	32,000,989	" 8,952,474
1896	25,338,103	41,160,877	" 15,822,774
1897	16,096,681	57,497,305	" 41,400,624

ROADS TO PROSPERITY.

The *Bulletin* of the American Iron and Steel Association says of some helps to prosperity and of some hindrances:

Will the new tariff restore prosperity to the country? Will it assure steady employment to all who are willing to work and bring back the old wages of 1892, before Mr. Cleveland's last election? It will certainly aid greatly in producing these much desired results; all its tendencies will be in the direction of better times. But there are unfavorable industrial conditions and social and economic evils in this country to-day which no tariff legislation can wholly cure. We have a greater capacity in almost all lines of productive industry than can be steadily employed, and in the struggle for business prices will be kept down, and low prices do not insure high wages. We have also a glutted labor market, made so by unnecessary importations of unskilled Europeans, and with an excess of laborers, even if this excess is but temporary, wages must follow the general law of supply and demand. The new tariff, as we have said, will help to bring back the prosperity of other years, but it should be supplemented as speedily as possible by more stringent legislation concerning immigration than is now on the statute books. That, and not currency tinkering, is the legislation that this country most needs next to the wise tariff legislation that has just been enacted.

Not only must there be well directed effort to prevent a further increase in the over-supply of labor, but the problem of increasing the means of employment must be taken up in earnest. What has been written for these columns by iron and steel manufacturers relative to increasing our export trade, is on the right track. Such increase, it is generally admitted, involves very considerable additions to the American merchant marine. This means that our ship-building industry must be stimulated in the next 20 years in a way that has never been known. And this industry must be depended upon to take the place our railroads have occupied in other years, as a consumer of our iron and steel. The one other important direction, we believe, in which home expansion is to be looked for, is in the culture of the sugar beet and the building up of a great raw sugar and refined sugar industry. With $100,000,000 sent abroad by the American people every year for sugar, the possibilities of home prosperity through the establishment of this industry on its agricultural and manufacturing sides, are practically limitless.

ALFRED B. DUFF, of the Duff's Patent Co., Pittsburg, was taken suddenly ill recently, while traveling in Europe and will be unable to travel for some time.

LAKE SUPERIOR IRON MINES.

Thos. H. Denham and C. Holden, commissioner and auditor respectively of St. Louis county, Minn., in which are all the iron mines of the State, have been investigating the system of taxing iron mining property in force in Northern Michigan. A specific tax of one cent a ton on the ore produced was in vogue in Minnesota previous to last year. At that time the Northern Michigan plan of assessing on the basis of valuation was adopted, but the entire equity of this arrangement is questioned by the mining companies. In Michigan the principal mines are located within corporate limits and the companies are therefore obliged to pay large municipal taxes for water works, sewers, lighting and other expenses. Most of these Michigan mining towns, moreover, are heavily in debt for improvements and from two-thirds to three-fourths of all taxes on these accounts falls upon the mining companies. In Minnesota, most of the mines are located in the townships, and these naturally do not expect to bear city expenses in the way that Michigan mines do. According to the valuations of last spring Minnesota mines are now paying a tax which runs from two and a half to six cents a ton, when divided by the output. It is considered that this is quite high enough, in view of the limitations upon the use of Mesabi ores in the blast furnace and the fact that the present season's sales have established a differential of about 50 cents a ton between Mesabi ores and those of like analysis from the old ranges.

The meeting of the union miners of the Marquette range called for last Sunday at Ishpeming was not held, owing to the weather, but the number of men who came out to ascertain whether an indoor meeting would be held was very small. The indications are that the effort to force non-union men into the union by refusing to work with them after Aug. 23, will be a failure. Generalship has been lacking in the labor movements in the Lake Superior country and in this case the leadership is particularly weak.

The Lake Superior Iron Co.'s steam shovel crew at Ishpeming loaded 135 large cars in ten hours recently, working on soft ore from the stockpile of Section 21 mine. Where there were no waits for cars, 15 cars an hour were loaded, the dipper taking two tons at a lift. The total was upwards of 3,600 tons. At the Cleveland Lake mine 115 of the large 30-ton cars of the Lake Superior & Ishpeming Railroad were loaded in ten hours, a total of 3,516 tons.

Freights on Southern Export Iron.

Some interesting facts concerning the route by which Alabama iron goes abroad are given by the *Railroad Gazette:* Since the first definite statistics on the subject of foreign pig iron shipments were kept, beginning Nov. 1, 1896, there has been shipped from the Birmingham district 138,870 tons to July 1, 1897. Sixty per cent of this tonnage has been shipped via Norfolk and the Southern Railway. The importance of this movement and its steady increase are shown by the following figures:

Exports via Norfolk:		Total Foreign Shipments:	
January	254 tons.	All ports	7,696 tons.
February	4,200 "	"	6,664 "
March	5,588 "	"	10,300 "
April	10,000 "	"	19,424 "
May	7,900 "	"	16,213 "
June	12,000 "	"	17,657 "

The table below shows the average maximum ocean rate from Norfolk to

Liverpool	$1.15	Bristol	$1.60
Manchester	$1.39 to 1.40	Glasgow	1.75
Hamburg	1.50	Antwerp	1.90

Approximately 30,000 tons of pig iron are now booked for movement during the cotton season, and the prospect is that this tonnage will reach 50,000. The export rail rate on pig iron from Birmingham to Norfolk is $2.21. The rail rate from Birmingham to Pensacola and Mobile on export iron is $1 per ton, and to New Orleans $1.60 per ton. The pig iron shipments from these ports have been light—first, on account of the small tonnage; second, the absence of a diversified cargo, and third, for the reason that these ports handle almost exclusively Liverpool and Manchester freights. The large shipments of grain and packing-house products and other dead-weight freight, via New Orleans, prevent the necessity for pig iron that exists at Norfolk.

Approximately 65 per cent of the foreign tonnage of pig iron moving from Southern ports has gone to the continent. Hamburg and Rotterdam have been the largest regular purchasers. Could space be had at this time to Liverpool and Manchester a heavy tonnage would move.

IRON AND STEEL EXPORTS.

Views of Manufacturers as to Their Permanence.

We present below some further contributions to the discussion of questions relative to the possibilities of export trade in iron and steel products, in answer to *The Iron Trade Review's* letters addressed to manufacturers:

A Central Western Steel Company.

An officer of a steel company in middle territory says:

I see no reason why the exports of pig iron, rails, steel billets, sheet and tin plate bars and finished metal products should not increase steadily each year, unless meanwhile the volume of business in this country together with the demand from abroad should equal or exceed the capacity to manufacture in this country, in which case I imagine prices would advance, which would cause exports to fall off or cease entirely. If Lake Superior ores should advance it certainly would be desirable, and I believe profitable to the ore companies, to furnish ores that enter into the manufacture of goods for export at as low prices as at present, thus enabling the manufacturers of this country to continue exporting. It is always necessary for manufacturers to produce maximum quantities if at the minimum cost.

I do not think of any action of Congress that could aid American manufacturers in the extension of trade abroad, in iron and steel, except to keep the tariff within moderate limits and not agitate the question further at all.

The general business situation certainly looks more encouraging than at any time since depression set in. With a surplus of idle money, plentiful crops, demanded by all the world at increased prices, promising outlook for exporting large products of our manufactures, daily increasing and encouraging demand at home, and a suspension of all legislation, why should we not feel confident for the future and why should we not expect to give full employment to all labor over the country? which, above all else, brings general prosperity and happiness to our people. The great requisite for a year or more past has been confidence, and my belief now is that those who do not become inspired will see their mistake, and that quite early. Let us then be moderate, and not hope for great and disastrous expansion, but let us pray for a prolonged period of active business, with fair returns to capital, and reasonable remuneration to labor fully employed, without legislation or strikes, without pools or other concentration of capital. Then we should be a happy, contented and law-abiding people, the greatest in the world, backed up by a country surpassing every other in agricultural and mineral resources.

A Pittsburg Iron Manufacturer.

Mr. Charles H. Reid, secretary and treasury of Zug & Co., Ltd., who operate the Sable Iron Works, Pittsburg, writes:

We have given the matter of exports of iron and steel products only casual consideration, and cannot perhaps give an opinion of much value, as compared with those in direct touch with such trade. We think, however, the export trade of the United States is in its infancy. Its growth will probably be slow and spasmodic for some years, or until manufacturers get closer to each other and frame a policy that will be national instead of individual in its character. Under normal conditions we have, and will have, a surplus in these lines, and the country is beginnig to realize that we must find an outlet for this surplus or the depressed conditions of past three years will recur and at shorter intervals. The hard times have developed many economies in methods of manufacture and in general expense items, and our improved machinery has reduced the labor cost per ton by the largely increased output Add to these the high and increasing cost of fuel in the leading foreign manufacturing countries, and the growing scarcity of the higher grade ores that have given them their prestige and you have a combination that has shorn the old campaign cry of cheap foreign labor of much of its terrors. Our manufacturers have recently found it possible to send their goods into foreign countries, and that the difficulties to be met were less formidable than imagined.

No doubt exports will fall off temporarily if we have a quick reaction from the low down depression that has ruled here in the past three years, but so soon as we have replaced what has worn out during this interval, and have met the first hurry of new and projected enterprises, the question of disposal of the surplus will early present itself—a surplus, too, that will grow more formidable each year. And as the export wedge has now fairly entered, it should be easier to widen the breach than ever before. In the past few years this country has stood still only in its power to consume. The power to produce has been stimulated and inventive genius has never been more active. Plants have multiplied and economies have been introduced that will remain and make imperative the necessity for new markets for the excess. How it is to be accomplished is the all-important question. Legislation alone will not accomplish it, for it is too tedious in its methods and is more or less handicapped by politics and overloaded with technicalities. Concerted action free from jealousy, on the part of chambers of commerce; the organization of manufacturers' clubs on the lines of the one that recently invited and entertained the Pan-American delegates in Philadelphia, and arranged their tour through the manufacturing centers—which has already borne fruit in large present business, with more in prospect; correspondence through bureaus of information with American consuls in countries giving best promise of trade extension; and arrangement by and with them, under direction of the Govenrment, for the establishment of general agencies or suitable display depots for American products most useful and likely to meet with encouragement in that particular locality—this with individual effort supplemented by intelligent legislation, dictated from commercial and manufacturing sources, would in our opinion pave the way to a new era of industrial prosperity in this country.

Our natural markets should be with Mexico, Central America, and our South American neighbors—countries all rich in natural resources, and poor in modern machinery and appliances for their development; and with China, Japan and Russian possessions in the far East, where railroad extension is opening up territory heretofore sealed. But we must have cheaper transportation to these markets. Our long rail hauls are too expensive, and around the Horn is too slow. More competitive rail lines will not secure sufficient reduction, for we need means of moving the immense tonnage growing out of the iron and steel industries, at smaller cost than railroads can afford to offer. Nature contributes largely to the desired end in our waterways which could take this heavy freight, leaving to railroads the handling of merchandise, meats, grains, fruits, live stock, goods requiring quick despatch, and interior and local traffic which could afford to pay more profitable rates for transportation than export goods, and which in time would occupy the roads to their capacity. As our manufacturing centers are near the Great Lakes or within easy reach of navigable rivers, these should be connected by canals with the waterways to the South, and the Gulf joined to the Pacific by a ship canal across the Isthmus or through Nicaragua. As transportation is such a material item of costs in this country, on its reduction will largely depend the extent of our export trade in the future.

Archer Brown, of Rogers, Brown & Co.

Mr. Archer Brown, New York resident partner of the well known pig iron selling firm of Rogers, Brown & Co., answers our questions in order:

First. I am of opinion that the export business in American iron—both in crude and finished forms—is going to steadily increase, and in time assume large proportions. Our cheaper raw materials and our better methods of manufacture are going to win the fight. It is a singular fact that the largest business so far in American iron and steel has been done almost at the center of production of English iron, namely, Manchester and the Lancashire district. It would seem to follow easily that if we can meet the English at their very source of supply, we can beat them in the outlying distant markets where their rates of freight are as high as our own. It is not

surprising, therefore, to find our trade growing rapidly in China, Japan, Australia, India, Russia, Spain, Italy, etc.

Second. The question of rebates from mining companies on ore entering into iron for export would be a different matter to manage. The railroads, however, are making lower rates for export business than for domestic, and it might be good business for the large ore and coke companies to make similar concessions, should it be found necessary to hold foreign trade after the inevitable rise in prices on this side.

Third. I know of no legislation by Congress or action by American manufacturers that is especially called for in the extension of our trade abroad. The main thing is to make the goods of high quality at low cost, foster transportation lines so as to secure reliable and permanent low freight, and push energetically, persistently and intelligently for trade.

An Ohio Blast Furnace Company.

From the Andrews & Hitchcock Iron Co., Youngstown, O.:

We think the exports of iron and steel can be kept up if the prices are low enough. All the railroads we know anything about in the ore country are making good money. We have reference to the Mesabi range. We do not think Congress will be any help to the export of iron and steel. The American manufacturers want to find out what people want in foreign countries then give them what they want, and keep prices low, and this country will export iron and steel. You cannot give steel makers a rebate on ore for export steel, as they will have to have all ore cheap, whether it goes into steel for domestic or foreign use.

General Manager Swank.

In the current issue of the *Bulletin*, Mr. James M Swank, general manager of the American Iron and Steel Association, makes the following comment on one phase of this discussion:

James Bowron, vice president of the Tennessee Coal, Iron & Railroad Co., who has written at various times on the question of iron exports from the Birmingham district, hits the nail squarely on the head in the following sentence in a recent letter to *The Iron Trade Review*. "The chief impediment to the extension of our exports of iron and steel, and the chief danger under future adverse conditions to the maintenance of the present trade, lies in the deficiency of suitable ocean freight accommodation." The missing link in our export trade of all kinds is direct steam communication with all parts of the world. With this link supplied there would be no temptation to compromise our protective tariff professions or to annoy friendly nations by injecting into our tariff legislation the thoroughly British policy of commercial treaties and so-called reciprocity. Our low prices and the excellent quality of our products would do the rest. They are accomplishing wonders as things are.

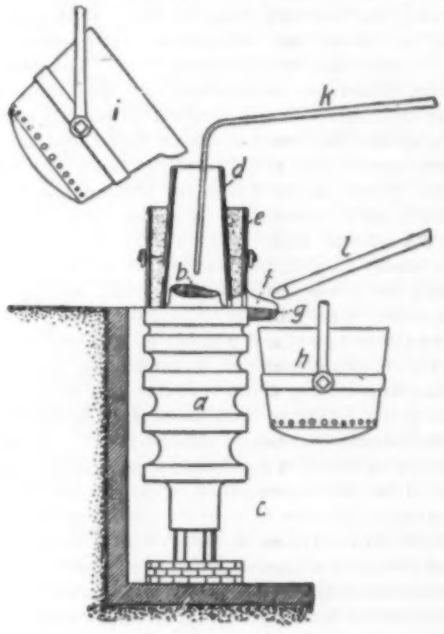
A Pennsylvania Steel Co.

An officer of a Pennsylvania steel company takes the view that some of the export trade of the past year may not be permanent, but that the gains in other directions will be considerable:

American exports of steel products will undoubtedly increase, but it is hardly to be expected that a trade that can be sustained year after year will be built up with Great Britain, Belgium or Germany or any other country with a considerable home production of iron and steel. The $4 freight rate that has prevailed recently more than offsets the present difference between American billets, tin plate bars and bar steel and the prices of like products in Great Britain. It is to be considered also in this connection that iron and steel products are now at their lowest here and at their highest in the United Kingdom and Continental countries. But we can compete with European works in supplying other countries. Where they have freight to pay we can not only meet them, but make prices that will take the business. Thus we can reach South American countries, China, Japan—in fact most of Asia and part of Europe. Russia's high tariff cuts us out there and the Russian works building or projected will more fully take that territory. Yet in European countries not themselves producers we should be able to take a large share of the business. Pennsylvania steel mills have been shipping abroad with some regularity of late, but as rails and billets are cheaper for the European buyer at home, under freights recently ruling, these products have not been largely represented. Tin bars of special sizes, structural shapes, plates, steel bars and sheets have made up the greater part of the shipments. For the reason stated little attempt has been made of late to sell rails in Great Britain, Belgium, Germany or France.

CONDENSED FROM THE TECHNICAL PRESS.

Casting a New Journal on a Broken Roll.—[*Uhlands Maschinen Constructeur.*]—A method of repairing a broken roll is described, with the illustration given herewith. The roll is set vertically in a pit with its broken surface projecting a few inches above the foundry floor. A fire of coke or charcoal is built around the fractured surface, bringing it to as high a heat as possible. When this has been done the fire is removed, the surface is cleaned and a mold of the proper form is set over the fractured end. A ladle of molten metal containing a considerably larger quantity than necessary to fill the mold is then brought and pouring begins. The molten iron heats the fractured surface as it falls upon it and flows away through the drain into the ladle h. This continues until the foreman by probing with the rod k finds that the fractured surface has become softened. The drain is then closed by the stopper l and the mold is filled. By this method the junction between the old and new surfaces is made so perfect that the roll is said to be as strong as when new.



Manganese Deposits in Virginia.—[*Engineering and Mining Journal, Aug. 7.*]—A description is given of some of the manganese deposits which lie along the western base of the Blue Ridge in Virginia, and are found at intervals between Vermont and Georgia. The ore is found in a well defined belt not more than 100 feet above the Potsdam sandstone. Geology tells us that in all probability iron ores and manganese ores were formed in the same manner, and hence it is commonly accepted that the presence of one indicates the proximity of the other. This is the case here also, iron ores being found side by side with the manganese ores. The article now describes the various workings and points of interest to be noted at each, then taking up the probable genesis of the ores. Analyses are given ranging as follows: Silica, 3.25 to 15.00; iron, 0.90 to 11.30; phosphorus, 0.10 to 0.196, and manganese, 42.61 to 47.37. In addition to the above, small quantities of cobalt, nickel, and copper are found. The article concludes with an interesting note regarding the comparative failure and lack of development of this section. The causes are lack of capital,

skill, and careful and thorough prospecting. A carload may be gotten out, badly prepared and shipped; the returns are not satisfactory. The result is abandonment of a property which by judicious handling might have been made to pay. Again, where numerous outcrops seemed to indicate a fair field, machinery is put up only to find out afterwards that a careful reconnaissance would have quickly killed the enterprise. The reader need not look very far to find a parallel in his own neighborhood. And yet these deposits are said to be very promising, the conviction being expressed that future developments will disclose large and profitable supplies of ore.

M.

Some Properties of Molybdenum Steel.—[*Stahl und Eisen, July 15.*]—Prof. Lipin of St. Petersburg contributes an article on the subject of molybdenum steel, in which he states that while the action of molybdenum is said to be the same as that of tungsten in steel, yet it would seem strange in view of the theory of Prof. Roberts-Austin to find it so, the atomic weight of molybdenum being 11.1 while that of tungsten is 9.6. This theory is a very interesting and elaborate one, and rests upon the apparent influence exerted by the elements on each other, taken in connection with their atomic weights and volumes.

Comparative tests were made with ingots of the respective steels having the following compositions: Molybdenum steel—carbon, .55; silicon, .10; manganese, .13; phosphorus, .024; sulphur, a trace, and molybdenum 3.72. Tungsten steel—carbon, .55; silicon, .07; manganese, .13; and tungsten, 3.80. Both were crucible steels and weighed 50 pounds each. The run of the melts was normal and each lasted four hours. The ingots were poured hot enough, and the metal did not rise in the molds. It was observed that on heating the blocks for the hammers, great care had to be taken, and the temperature was not allowed to go over cherry red. Molybdenum steel was readily forged, and the surface of the forging while exceedingly hard, was free from the cracks usually found in tungsten steel. The fracture was dark, fine grained, and looked like chrome steel. A number of test bars were forged out of these steels and a series of hardening and annealing tests made, with results which varied widely according to the treatment given. Tabular statements of these tests are given, but the deductions are of more interest to us. It was found that strongly annealed molybdenum steel is softer than tungsten steel of the same composition; it should, therefore, not be heated so high, and what is right for carbon or chrome steels is dangerous for molybdenum steel. Furthermore, hardening in oil and then annealing was found of no value, this process being better adapted to tungsten steel. Hardening in water, however, is better for molybdenum steel, although its elastic limit is lowered. In forging, tungsten steels are liable to develop longitudinal cracks, which is not the case in the other.

Molybdenum is therefore very similar to tungsten steel although it can stand more, being softer or harder for each respective treatment. It is probable that molybdenum steel might in a measure replace tungsten or at least chrome tungsten steel.

M.

THE TIN PLATE MARKET.

The past week has developed a decided change in the general tone of the tin plate market and, following the improved conditions in other lines prices may be quoted to-day much fimrer than at any time since July 1. It is true that there has not been any large amount of business done either for spot goods, or upon future contracts; but a large number of inquiries for 1898 delivery are upon the market and the general feeling among the mills seems to be that prices will rule considerably higher and there is little anxiety to sell far futures on the present low basis. A number of the larger mills have withdrawn entirely from the market as sellers beyond Jan. 1, and, while it is true that some large contracts have been placed for 1898 delivery, it is equally true that these contracts could not be duplicated to-day for an advance of 5c per box.

Spot and near-by deliveries are hard to get, many of the mills being still behind on their contracts, and the fortunate holders of spot plates are able to command fair prices. With the prospect of higher-priced steel and the certainty of increased labor cost, it is believed that tin plates for 1898 will prove a good purchase at present market.

We quote as follows for October, 1897, to July, 1898, f. o. b. maker's mill:

CHARCOAL TINS.

	IC	IX
Lisvane Grade,	$3.60	$4.35
Calland Grade,	3.80	4.55

COKE TINS.

IC, 108, Basis weight,	$3.10
100 lb. " "	3.00
95 lb. " "	2.95
90 lb. " "	2.90
85 lb. " "	2.85
80 lb. " "	2.80

TERNE PLATES.

IC, 216 lb., 20 x 28	$6.05
200 lb. "	5.75

August and September deliveries in coke plates 5c to 10c per box over above.

CONDITION OF BLAST FURNACES OF U. S.*

Aug. 1, 1897.

Location of Furnaces.	Coke and Anthracite.					Charcoal.				
	Total No. of Stacks.	In Blast.		Out of Blast.		Total No. of Stacks.	In Blast.		Out of Blast.	
		Number.	Weekly capacity.	Number.	Weekly capacity.		Number.	Weekly capacity.	Number.	Weekly capacity.
New York	20	2	2172	18	12025	5	1	84	4	468
New Jersey	8	2	1618	6	2527	.....	.....	.....	.....	.....
Spiegel	3	2	377	1	100	.....	.....	.....	.....	.....
Pennsylvania:						13	1	51	12	695
Lehigh Valley	37	7	4442	30	13480	.....	.....	.....	.....	.....
Spiegel	1	0	0	1	70	.....	.....	.....	.....	.....
Schuylkill Valley	22	4	3234	18	9975	.....	.....	.....	.....	.....
Upper Susqu. Val.	8	3	1800	5	1749	.....	.....	.....	.....	.....
Lower Susqu. Val.	9	3	3440	6	3393	.....	.....	.....	.....	.....
Spiegel	1	1	518	0	0	.....	.....	.....	.....	.....
Lebanon Valley	13	4	3034	9	4384	.....	.....	.....	.....	.....
Pittsburgh	27	23	45099	4	5433	.....	.....	.....	.....	.....
Spiegel	3	3	3660	0	0	.....	.....	.....	.....	.....
Shenango Valley	16	6	7665	10	9630	.....	.....	.....	.....	.....
Jun. and Con. Vals.	13	4	6132	9	4976	.....	.....	.....	.....	.....
Spiegel	1	1	247	0	0	.....	.....	.....	.....	.....
Youghiogheny Val.	3	1	1223	2	1900	.....	.....	.....	.....	.....
Miscellaneous	4	2	1750	3	1964	.....	.....	.....	.....	.....
Maryland	5	3	4185	2	1670	4	1	125	3	428
Wheeling District	9	5	4645	4	5118	.....	.....	.....	.....	.....
Ohio:						9	4	229	5	489
Mahoning Valley	11	4	6186	7	9374	.....	.....	.....	.....	.....
Central & Northern	11	7	9895	4	4248	.....	.....	.....	.....	.....
Hocking Valley	12	0	0	12	5120	.....	.....	.....	.....	.....
Hanging Rock	12	3	1093	9	2414	.....	.....	.....	.....	.....
Indiana	2	0	0	2	408	.....	.....	.....	.....	.....
Illinois	14	9	16571	5	9050	.....	.....	.....	.....	.....
Spiegel	1	0	0	1	1150	.....	.....	.....	.....	.....
Minnesota	1	0	0	1	629	.....	.....	.....	.....	.....
Wisconsin	4	2	2311	2	1674	3	0	0	3	1465
Missouri	2	0	0	2	740	1	1	370	0	0
Colorado	3	0	0	3	4620	.....	.....	.....	.....	.....
Virginia	23	8	5903	15	8275	4	0	0	4	437
Kentucky	6	2	670	4	2650	3	0	0	3	200
Alabama	39	16	17243	23	15200	12	1	275	11	2594
Michigan	.....	.....	.....	.....	.....	15	4	1621	11	4417
Tennessee	13	5	4424	8	4109	9	2	508	7	2200
Georgia	2	0	0	2	960	3	1	300	2	360
North Carolina	2	0	0	2	600	.....	.....	.....	.....	.....
New England	.....	.....	.....	.....	.....	11	3	260	8	750
Texas	.....	.....	.....	.....	.....	4	1	200	3	790
Utah	.....	.....	.....	.....	.....	1	0	0	1	175
Oregon	.....	.....	.....	.....	.....	1	0	0	1	275
Totals	362	132	161375	230	148825	98	20	4003	78	15743

SUMMARY.

Fuel.	In Blast.						Out of Blast.			
	Number.			Weekly Capacity.			Number.		Weekly Capacity.	
		Month Previous.	Year Previous.		Month Previous.	Year Previous.		Month Previous.		Month Previous.
Charcoal	20	14	23	4,003	2,894	6,264	78	83	15,743	16,302
Coke and Anthracite	132	131	150	161,375	161,170	150,814	230	231	148,825	147,429
Total	152	145	173	165,378	164,064	157,078	308	314	164,568	163,731

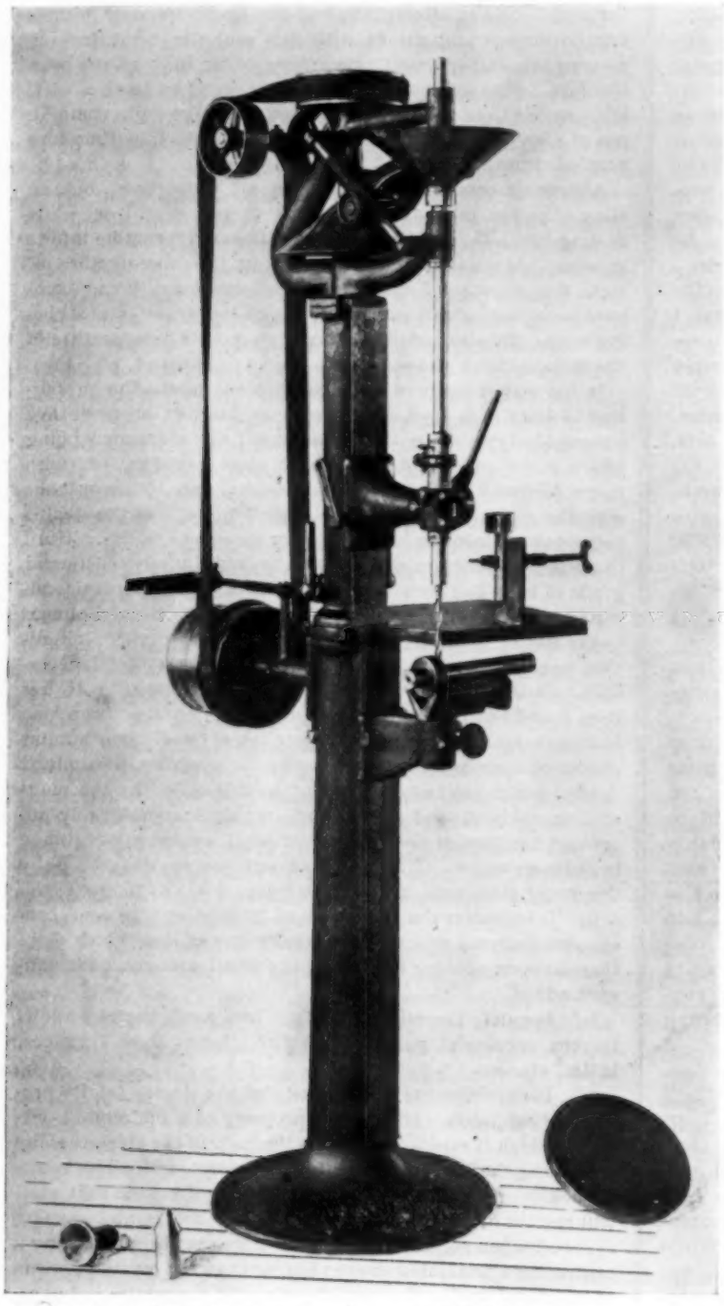
*The above table is condensed from the *Iron Age*. The tables of the *American Manufacturer* show in blast Aug. 1, 148 furnaces, with 167,261 tons weekly capacity instead of 165,378 as above.

George Gibbs, mechanical engineer of the Chicago, Milwaukee & St. Paul Railway, has been chosen as consulting engineer for the Westinghouse Electric & Mfg. Co., and the Baldwin Locomotive Works, to fill the place made vacant by the death of D. L. Barnes.

FRICTION SENSITIVE DRILL PRESS.

The tool shown in the accompanying illustration is the invention of J. W. Hawkins, of Cuyahoga Falls, O. One of its special features is its driving mechanism, consisting of two cones or conical disks, between which is held a friction roller, transmitting power to the spindle. The roller is adjustable radially with the cones which by shifting over a distance of four and a half inches give a variation in speed of 1,205 revolutions a minute. Thus speeds are obtainable for any size of drill up to 9-16.

The cone that drives the spindle is mounted on a bushing



which extends through both bearings in the frame. The spindle is thus relieved from any lateral pressure, and the machine enabled to run without heating.

An improved stop collar is used on the spindle sleeve and it can be removed when not in use by removing the binding screw. The adjustment screw in the collar admits of quick adjustment. The point is hardened and a hardened steel plug provided for contact with it prevents inacurracy from wear and the stop being placed on the spindle sleeve prevents springing of the frame.

The square platen is seven-eighths of an inch thick and is finished alike on both sides. In case it becomes defaced, it can be reversed, and practically serves as a new table.

Aside from the extra table and cup center, a center point is furnished, also a V block and a supplementary V block. The main or master V is provided with a stem or gudgeon, which is received by the lower arm on the column, and insures perfect alignment of the drill with the cylindrical work placed in it. The supplementary piece is for use on small round work, or work having shoulders or collars and is provided with a foot or base so that it can be used on the platen, especially for work required to be drilled eccentrically.

Height over all is 6 ft. 3 inches; the floor space 33x29 inches. The greatest distance from the square table to the end of spindle is 12 inches, and the greatest distance from round table to the end of the spindle is 41 inches. The size of the square table is 12x14 inches.

The machine has been perfected to a high degree and is now in use with successful results. It is jigged for producing all the parts accurately and rapidly. The company that manufactured this drill have gone out of business, and the patterns, jigs and special tools together with the patent are about to be disposed of by the inventor, J. W. Hawkins, superintendentof the Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

The Largest Coast Defence Gun Ever Cast.

On the 12th inst. the Bethlehem Iron Co. made the heaviest open-hearth gun ingot which has ever been cast. It required metal from three furnaces to fill the mold. The ingot weighed 213,000 pounds or nearly 100 gross tons. It was octagonal in shape. The length was 16 feet 10 inches and the diameter 74 inches. This ingot will be forged into a tube for a 16-inch experimental nickel steel gun which this company is to make for the United States Army. The forged tube will be 35 calibers or 46.6 feet in length. The jacket for this gun will require an octagonal ingot of even greater weight, namely, 243,000 pounds, or 108 tons.

Even these large masses of steel have been exceeded in the rectangular ingots cast by this company for armor plate. The 17-inch port plates for the two turrets for the 12-inch guns of the battleship Iowa required nickel steel ingots weighing 273,500 pounds, or 122.1 gross tons.

Ohio Coal and Iron Ore Production.

The 22d annual report of the Chief Inspector of mines for Ohio has just been filed with the governor. The statistical tables show that the coal production in 1896 equaled 12,912,908 tons, a loss as compared with 1895 of 771,271 tons. The Hocking valley, composed of Athens, Hocking and Perry counties, produced 4,430,036 tons, or 34.2 per cent of the entire production, as compared with 34 per cent in 1895, 36.7 per cent in 1894, 38.4 per cent in 1893 and 37.7 per cent in 1892. The amount of coal delivered at Lake Erie ports in 1896 was 8,961,327 tons, of which 3,175,722 was anthracite. There was a gain of 1,543,692 tons in the shipments of bituminous coal to the lake ports over 1895. Of the total of bituminous coal, 4,337,815 tons came from Pennsylvania mines, 1,267,035 tons from Ohio, 159,117 tons from West Virginia and 1,638 from Maryland. The Pennsylvania shipments showed a gain of 1,755,828 tons over 1895. Of the years production of coal in Ohio, 3,368,349 tons was mined by machinery.

The iron ore production was confined to the counties of Jackson, Lawrence and Scioto which mined 70,765 tons of hematite ore, a loss of 22,286 tons as compared with the year 1895.

July showed the largest month's record Two Harbors has ever had, 160 vessels clearing with a total of 508,160 gross tons. The total shipments to Aug. 1 from this port were 1,240,160 gross tons.

Andrew Carnegie has offered the town of Stirling, Scotland, the seat of the palace and Parliament house built by James V., $30,000 to build a public library building.

USE OF ALUMINUM WITH IRON AND STEEL.*

BY ALFRED E. HUNT.

Until the present decade, the attention and research of everyone interested in the metal aluminum were directed almost exclusively to problems connected with the cheap production of the metal by means more adapted for large commercial operations than by the processes by which it had previously been manufactured. The prevailing and popular opinion had been that if anyone should be fortunate and skilful enough to produce aluminum so cheaply that it could be sold at a profit at the price of a dollar per pound, the consumption of the metal would become enormous; and if it could only be sold at the price of 50 cents per pound—a price which, taking its relative specific gravity into account, would nearly approach that of copper and brass—the demand for the metal would be prodigious, and the profits which would accrue to the manufacturers would be of such fabulous amounts as simply to take one's breath away to attempt to estimate them. Much of this sort of speculation has it been my lot to hear, and, I may truthfully say, to endure, from inventors of processes for the manufacture of aluminum (in my investigation as to their relative values), which have since proved to be either chemically impossible or commercially impracticable.

Early in the progress of the Pittsburg Reduction Co., in the manufacture of aluminum, working with the Hall process, I had my attention sternly called to the necessities of the case to the fact, which further and larger experience has simply verified, that the problems connected with the promotion of the sale of aluminum, its adaptability for various purposes, and the utilization of the metal and its alloys in the arts, were as difficult of solution as the problem of cheapening the processes for its production, and required as much research; offering a great many more opportunities for remuneration than would the search for cheaper modes of production. The exploiting on a considerable commercial scale and the perfecting of the details of the Hall process, as carried on by the Pittsburg Reduction Co., at its several works at Niagara Falls, N. Y., and New Kensington, Westmoreland County, Pa., have already permitted the selling price for aluminum in large quantities to be placed much below the relative price for copper and somewhat below the relative price for brass.

Aluminum is now selling in large quantities at 31 and 32 cents per pound, in ingots; and the relative increase in price for sheets, plates and bars, over the price for ingots, is not greater than that charged for either of the metals copper or brass. Copper sheet, according to the Official Copper Manufacturers' price list, has a specific gravity of 8.93 and brass sheet varies (as it does also in composition) from 8.15 to 8.20 specific gravity. Aluminum sheet runs from 2.62 to 2.66 specific gravity. On the basis of their specific gravities, copper can be reckoned as being 3.3 times heavier and brass 3.15 times heavier than similar sections of aluminum. The consumption of the common metals in the United States during 1895 was as follows:

	Short Tons.		Short Tons.
Copper	156,000	Lead	161,440
Brass	60,000	Tin	27,126
Zinc	89,686	Nickel	375

The output of aluminum in the United States during 1896, which was practically all consumed within that period, was only about 1,300,000 pounds; and the output for the year 1897 will be about 2,000 tons, and of this, I estimate a consumption of only about 1,000 net tons in the United States. While the partial replacement of brass by aluminum will undoubtedly take place, in accordance with the law of the survival of the fittest," nevertheless, so great is the conservatism of trades people, that it will be only slowly that its relative merits and relative cheapness will win for aluminum its eventual position in importance as compared with the other common metals of large tonnage consumption, such as copper, brass, zinc, tin and lead. It has already met and outdistanced nickel in the amount of its consumption.

While the output of less than 2,000 tons of aluminum, in the year 1897, is very small as compared with the consumption of 156,000 tons of copper and 60,000 tons of brass during the year 1895 in the United States, and while it is a fact that aluminum is now offered at prices considerably lower than copper for any given purpose, and fully as low as brass in many cases, nevertheless, the Pittsburg Reduction Co. will be quite satisfied if its entire output for the present year is taken by the trade. In a general way, the uses of aluminum have enlarged very much during the past eight years; and, from a consumption, in 1889, of not over 100 pounds of aluminum per annum in the United States (selling at not less than $8 per pound), the metal has pushed its way to the front to a consumption of over 600 tons in the year 1896.

Aluminum with Steel.

As one of the most important uses of aluminum has been its utilization in the manufacture of steel ingots and steel castings, I think it well to commence with this special use of the metal. Many attempts have been made to alloy aluminum in various proportions with iron and steel; but thus far no very satisfactory results regarding its use in iron have been obtained. The influence of aluminum seems to be as a softener, rather than a hardener, for iron; and the more common use of alloying metals as hardeners with steel, is therefore precluded in this case.

Aluminum combines with iron in all proportions, but an alloy of 50 per cent aluminum and 50 per cent iron, while casting into a solid mass, in a short time will crumble into a powder. Aluminum is largely used in the manufacture of steel, the amount of aluminum used, however, being comparatively very small and varying with the grade of steel being made, the amount of occluded gases, the temperature of the molten metal, the size of the ingots or castings, etc.

In the manufacture of open-hearth steel ingots, the proportion of aluminum used is from two to four, or at most five ounces of aluminum to the ton of steel; the aluminum being added in the ladle as in the case of steel castings, or (with more economy in the use of aluminum, and in accordance with the general practice in the United States), as the steel is being poured into the ingot molds or groups of molds. Until the proper proportion of aluminum to add in any particular grade of steel has been determined experimentally, it is advisable to start with small lots, for instance, with two ounces to the ton of steel, increasing to, say, five ounces of aluminum per ton, according to the amount which is found necessary, noting the character of the results obtained. It has been found that Bessemer steel ordinarily requires from one to three ounces more aluminum per ton of steel than similar grades of open-hearth steel, in order to have the same effect. A steel which has become "wild," as it is called by the melters, or oxidized and overheated, requires considerably increased amounts of aluminum over what is used to advantage in ordinary cases. The special advantages to be gained by the use of aluminum in steel manufacture are as follows:

(1) It increases the soundness of tops of ingots and consequent decrease of scrap and other items of loss, which more than compensates for the cost of the small amount of aluminum added.

(2) It quiets the ebullition in molten steel, thereby allowing the successful pouring of "wild" heats from furnaces, ladles, etc.

(3) It improves the homogeneity of the steel: (*a*) By preventing oxidation. (*b*) By that property of aluminum in virtue of which it rapidly permeates the body of the steel, thereby increasing the ease with which other metals will alloy homogeneously with steel. (*c*) By decreasing the time that steel will remain fluid after being poured into molds and causing the steel when solidifying to do so more evenly, preventing a central core remaining molten longer than the outside portion of the metal, and in this way stopping the segregation of phosphorus and other impurities in the "mother liquor" of the metal remaining molten the longest.

(4) It increases the tensile strength of steel without decrease of the ductility.

(5) It removes any oxygen or oxides that may be in the steel, the aluminum acting, in the same way as manganese does, as a deoxidizer. Good steel has been made for electrical purposes, using aluminum entirely in the place of manganese, to remove occluded oxygen and oxides from the molten steel and render it malleable.

(6) It renders the steel less liable to oxidation in casting. This is occasioned by preventing the continued exposure of fresh surfaces of the molten steel in its ebullition in the molds after pouring.

* From a lecture delivered before the Franklin Institute, on "The Utilization of Aluminum in the Arts."

(7) It permits the production of smoother surfaced castings and ingots of steel than it is possible to obtain without the use of aluminum.

The chief advantage in the use of aluminum in steel is that first named, i. e., increasing the soundness of the tops of steel-ingots and decreasing the scrap and other loss; and for this purpose the use of aluminum in the manufacture of steel is now becoming almost universal with the principal steel manufacturers, not only in this country, but also in Europe. The phenomenon of quieting steel by the use of the very small proportion of aluminum referred to, is a very important and remarkable one. Steel poured from a ladle into an ingot mold without being treated would ordinarily boil for 10 or 15 minutes before "freezing over" at the top, and when freezing would rise in the molds for eight or ten inches, with ordinary steel of ten-hundredths to twenty-hundredths of one per cent carbon, unless heavy chills are placed on the tops of the ingots. When aluminum is added, however, the steel will come up to the required level and remain there, freezing over within 30 to 45 seconds after the last of the steel is poured into the ingot mold. Comparative results of the use of aluminum in steel can readily be shown by pouring two ingots side by side from the same ladle of molten steel, one treated with aluminum in the ingot mold and the other not so treated.

There is danger in adding too large a quantity of aluminum to ingot steel, in which case the metal will settle very solidly and will be liable to form deep "pipes" in the ingots. To add just the right proportion of aluminum to the steel requires some experience on the part of the steel manufacturer.

This danger of the piping of the metal is not a serious one in ingot steel if care be taken to determine just the right proportion of aluminum to use, in order to prevent the formation of too many blow holes at the top of the ingot. With the metal entirely solid —that is, with too much aluminum added —the shrinkage, due to contraction, will produce pipes, which will occasion a serious amount of crop ends or defective steel at the top of the ingots.

In the case of the manufacture of steel castings, this trouble is not experienced; the problem is simply to get a solid steel casting, and much larger proportions of aluminum are added in castings than in the practice of making steel ingots, the piping, due to shrinkage in the metal, being taken care of in the large "riser" or sinking-head, which is provided for steel castings. No difficulty has been experienced with the thorough mixing of the aluminum added to steel, as it seems rapidly and uniformly to permeate the metal without any special care being taken in stirring. This property aids in the homogeneous alloying of nickel and other similar metals to steel as well; and steel manufacturers use aluminum in addition to nickel for this purpose.

Mr. R. A. Hadfield, of Sheffield, Eng., says that the influence of aluminum in steel appears to be like that of silicon, though acting more powerfully. The same writer (who is confirmed by Howe and Osmund), claims that an addition of aluminum does not lower the melting point of steel, i. e., that the critical point is about the same whether aluminum be present or not. It is the aim, however, in adding aluminum to iron or steel, to add just enough to combine with all the oxygen present, but to leave no trace in the ingot or casting; any more than this is not required.

Mr. J. E. Stead states that in a case where aluminum had been added to ordinary soft open-hearth steel with properly prepared molds, the castings were very sound indeed. The test bars which were cast about eight inches long by three-quarters of an inch square, were perfectly sound, and had a tensile strength of 40,000 pounds per square inch; whereas the same bar, without aluminum, only stood 20,000 pounds, the reason being that in the ordinary steel without aluminum the cavities were very numerous. A few hundredths of one per cent of aluminum in that casting increased the weight and solidity and reduced the blow-holes by 23 per cent.

There are no such metals as "aluminum steels," in the same sense that there are "nickel steels" and "chromium steels." Aluminum is not a hardener of steel, and none of its alloys with steel in material proportions has so far proved advantageous. It has been proved that the addition of aluminum to steel just before "teeming" causes the metal to lie quiet and give off no appreciable quantity of gases, producing, as previously stated, ingots with much sounder tops.

There are two theories to account for this: one, that the aluminum decomposes these gases and absorbs the oxygen contained in them; the other, that aluminum greatly increases the solubility in the steel of the gases which usually are given off at the moment of setting, thus forming blow-holes and bubbles.

Probably both of these causes operate to produce the desired effect, but the well known affinity of aluminum for oxygen would point to the former as being the chief action, i. e., in combining with both the carbonic oxide and the dissolved oxide of iron which may be present. Professor Arnold has shown that blow-holes in steel and iron are caused partly by the presence of carbonic oxide gas in the metal, and this gas is decomposed by the aluminum which unites with the oxygen, forming alumina, or oxide of aluminum, setting free the carbon, which appears as uncombined carbon or graphite. It also combines, in some way not yet determined, with the hydrogen, and nitrogen present, absorbing the gases or rendering them more soluble in the steel. Aluminum also sets free much of the carbon remaining in the steel, as the following result, obtained by Mr. R. A. Hadfield, will clearly show. Believing that aluminum, like silicon, will cause a precipitation of graphite, he added between three and four per cent to ordinary spiegel (with 12 and 25 per cent manganese). The result was, in both cases, a complete change from the well known spiegel fracture to that of ordinary close No. 3 gray pig iron.

	C. C.	Gr. C.	Si.	Mn.	Al.	
SPIEGEL.						Non-magnetic susceptibility unaltered.
12 per cent. before addition of Al.	4.80	none.	.....	13.65	.....	Fracture changed from usual pronounced "Spiegel" appearance to that of No. 3 iron.
12 per cent. after addition of Al.	.93	3.45	1.30	11.75	3.19	
25 per cent. before addition of Al.	1.10	.....	.....	25.20	.....	Do. except the change was not quite so decided.
25 per cent. after addition of Al.	2.30	1.88	2.16	22.16	1.24	There was considerable loss of aluminum.

Aluminum is the principal deoxidizer known to metallurgists, the next in efficiency being silicon. Their relative values are as follows: 100 parts by weight of oxygen will combine with 114 parts of aluminum, or with 140 parts of silicon, or with 350 parts of manganese. This, however, does not correctly express the value of aluminum as a deoxidizer of iron and steel, as it has so great an affinity for oxygen that it will entirely disappear if there is any oxygen present, and will be found in the steel and iron only after all the oxygen contained therein has been absorbed. This is not the case with either silicon or manganese, as either or both of these are often found in the steel when oxygen is present. There is also an additional inducement for the steel maker to use aluminum, namely, in the cost, for the use of silicon will add from 87 cents to $1.12 to the cost per ton of steel, while sufficient aluminum will not add over 10 cents, and in many cases not more than six cents per ton, to the cost of the steel. The saving in bad castings, or unsound ingots, will repay this many times over. One large English steel maker estimates his savings from this source alone at over £2,000 per annum. The special advantage to the steel maker seems to be that aluminum combines the effect of both silicon and manganese.

In most common practice, aluminum is added to steel in the form of the pure metal. In this form, it has the advantage not only of quickly melting and homogeneously alloying, but the manufacturer knows also just how much aluminum he is adding, which is not the case if he purchases alloys of aluminum for adding to the steel.

Some manufacturers, however, prefer to use ferro-aluminum rather than pure aluminum, in their practice.

In this country, the alloy is first placed in the steel ladle, the molten steel from the open-hearth furnace or converter is run in and the alloy is melted and diffused through the steel.

Ferro-aluminum is a trade name given to five or ten or even 20 per cent of aluminum alloyed with iron. Either a good grade of cast iron, free from sulphur and phosphorus, or of pure steel low in these elements, is the best material to be used for the purpose of alloying with the aluminum.

Most users of ferro-aluminum make their own ferro-alumi-

num by adding known weights of pure aluminum to known weights of steel or iron mixture with which they wish to alloy, casting the mixture into convenient molds.

In the past, ferro-aluminum could be purchased at a cheaper rate per unit of aluminum than the pure aluminum; but this is not the case at present, as pure aluminum can be bought as cheaply as the contained aluminum in any of the alloys.

Aluminum with Iron.

In cast iron, from one to two pounds of aluminum per ton is put into the metal as it is being poured from the cupola or melting furnace. To soft gray No. 1 foundry iron, it is doubtful whether the metal does much good; but where difficult castings are to be made, where much loss is occasioned by defective castings, or where the iron will not flow well or give sound and strong castings, the aluminum certainly in many cases allows better work to be done and stronger and sounder castings to be made, having a closer grain, and hence much easier tooled. The tendency of the aluminum is to change combined to graphitic carbon, and it lessens the tendency of the metal to chill. Aluminum in proportions of two per cent and over, materially decreases the shrinkage of cast iron.

The effect of aluminum in wrought iron is not very marked in the ordinary puddling processes. It seems to add somewhat to the strength of the iron, but this increase is not of sufficient value to induce the general use of aluminum for this purpose. The peculiar property of aluminum in reducing the long range of temperature between that at which wrought iron first softens and that at which it becomes fluid, is taken advantage of in the well known Mitis process for making "wrought iron castings." It is for this that aluminum is most used in wrought iron at present.

POINTS IN CYCLE CONSTRUCTION.*

BY F. J. OSMOND.

The pricncipal causes of inefficiency in a cycle are friction and want of rigidity. Of the two, probably want of rigidity is the more important. It is in this particular that cycles differ far more than in friction. And it is invariably found that the more rigid machine is also the faster. The cause is twofold. First, the work done in springing the frame out of shape at each stroke of the foot is not spent in driving at the end of the down-stroke, but only in lifting the foot at the begining of the up-stroke. Second, the springing of the frame causes a general condition of instability, due partly to the alteration of the balance through lateral movement of the pedals, and partly to the wheels being forced out of line, thereby causing the machine to swerve from side to side instead of running a true course. In a machine with well-constructed bearings friction is mainly due to the chain. The consequent loss is variouly estimated; as low as one per cent of the total power has been recently given. Probably, however, the loss was measured when the chain was not doing any work, which would make the test fallacious. About five per cent seems nearer the truth.

It has been said that the factor of safety for a cycle frame is about one and a quarter. If this is understood to mean that a machine designed for a 12-stone rider should not be ridden by one exceeding 15 stone, it is probably not far out in most cases; yet a well-built frame will carry a steady load of at least ten times this weight without injury. Any considerable obstacle surmounted by the front wheel causes two distinct shocks, the first oblique and the second vertical; and these shocks will in general tend to bend the front tubes first in one direction and then in another. The bending moments are greatest close to the head, just where the tubes have been weakened by brazing. It is therefore necessary to provide some local strengthening. This is given by shrinking a reinforcement about four inches long upon the outside of the tube ends. The tubes are brazed together at the ends, tapered in a lathe, and the whole then brazed into the lug. By this means the part weakened by the brazing is kept within the reinforcement, and breakage is practically impossible. Although there is an evident advantage in increasing the diameter of tubes subjected to bending and tension, yet, as the thickness must be reduced in order to retain the same weight, a limiting ratio of diameter to thickness is soon reached, which cannot be exceeded without danger of the tube failing through buckling induced by some small local stress due to dents, etc.

Allusion was made to the advantages of aluminum and its alloys as compared with steel, and it was stated that the best aluminum alloys have about 16 per cent less strength and rigidity when drawn into tube than a steel tube of the same weight and outside diameter; but, owing to its much greater thickness the aluminum tube can be made of larger diameter without danger of buckling. The advantages so often claimed for "webbed" tubes are apparent only when the tube is tested in short lengths and loaded in the center. When tested with proper precautions webbed tubes are both weaker and less rigid, weight for weight, than plain tubes. Corrugated tubes have the advantage of resisting local stress better than plain tubes; but they are less rigid, weight for weight, and present difficulties in jointing. Nickel steel is as rigid as carbon steel, and has the advantage of a higher elastic limit. It is, therefore, well suited for the two front tubes of a cycle, which are the most subject to vibration.

In considering the design of a safety bicycle frame too little attention is generally paid to what might be called the driving stresses—that is, those set up by the pressure of the foot upon the pedal, which cause lateral distortion of the frame. There are two distinct cases to be considered—first, when the pressure of the foot is balanced by a pull at the handle on the same side; and, second, when there is no pull at the handle. The chain stays are perhaps the most important part of the frame of a cycle. Before the extreme importance was realized of a narrow tread for constituting a straight-running machine, round chain-stays of seven-eighths inch diameter were often used, which gave ample stiffness; but now that there is a premium on every eighth of an inch under five inches clear width between the pedals, it is necessary to reduce this diameter to about five-eighths inch. A tube of round section five-eighths inch diameter is only about half as stiff as one seven-eighth inch diameter of the same weight, and has only about 70 per cent of the strength. It therefore becomes necessary to use a section giving greater rigidity and strength than the ordinary round tube. The choice lies between oval, rectangular, and D sections. The last of these, the writer has chosen as the most suitable, in consideration of the nature of the stresses to be met. The chain stays designed by him are shaped with a slight bend in the middle, so as to clear the crank end. This construction has been criticized as causing a bending moment at that point, tending to buckle inwards the stay on the chain side; but experiment shows that the total bending moment is not a maximum at that point, and consequently the slight inward bend does no harm. On the subject of D tubes for chain stays there exists some misapprehension. The writer explained his reasons for using them, and said that for the same width and weight they are more rigid than round or oval. It is only by the employment of tubes of larger diameter that the increased distorting stresses can be properly met.

There seems to be a general tendency to duplicate the back fork in multicycles; but greater rigidity can be secured by means of a single fork of large section, provided it is properly connected to the top of the rear seat-pillar lug. Crank length must be decided by the rider's natural length of stride, and the ratio of multiplication of gear to length of crank must depend upon his muscular development, both of which data may be approximately ascertained by measurement. The gear is then the product of the two factors so determined. The maximum ratio of multiplication for road riding is about 12 times, and the minimum about nine times. The maximum length of crank may be taken as about seven and a half inches and the minimum six inches. Hence the gear may vary from 90 inches down to 54 inches.

* Synopsis of a paper read at the recent Jubilee meeting of the Institution of Mechanical Engineers at Birmingham, Eng.

THE following is the production of minerals as reported to Dr. Eugene A. Smith, State Geologist and secretary of the Alabama Industrial and Scientific Society, by the producers for the month of June, 1897: Coal, 359,495 tons; coke, 94,211 tons; iron ore, 149,499 tons; pig iron, 64,583 tons; flux, 44,956 tons; bauxite, 727 tons for May, 1,051 for June; building stone, 3,200 cubic feet. Number of employees, 14,962.

THE PRESSURE OF FLUID IRON.

BY R. D. MOORE.

One of the weak points in the practice of the average molder is the want of a well-defined rule for estimating the pressure of the metal on his mold. Ramming, clamping, weighting, anchoring, pit-ramming, and otherwise sustaining molds when poured have all to be regulated by this pressure. Yet, important as such a rule is, the average molder is willing to rub through a foundry life without ever seeking for such an important but simple rule. A column of fluid iron four inches high gives a pressure of one pound on every square inch of surface. This rule is not exactly correct, but it is near enough for molders to work by, as a considerable margin of safety is necessary to compensate for extra strain that many molds are liable to be subjected to from various causes. Among these extra causes of strain may be named the fall of the metal from the ladle, one or two feet, into a small funnel gate, which is a considerable source of pressure, especially if the rise gates are small.

The jar given by the explosion of gas under a bottom board immediately after pouring is a cause that has fatally "strained out" well-clamped molds. The blowing of molds adds greatly to the static pressure of the iron.

There is a very common practice among molders of hammering a flask when blowing occurs. That is a delusion. The settling at each blow merely shows how much additional strain each blow has given the metal. The exact static, or standing, pressure given on a mold is a considerable fraction over a pound by a four-inch column or gate. Careful experiments show that in a column or gate 24 inches high it is increased from six pounds on a square inch to six and four-tenths pounds, or nearly a half pound increase. It may not have suggested itself to many that a bar of iron any size or shape, if parallel, can be made an instrument for testing the ramming of a mold by setting it on end on the mold. The length should be the height of the gate from the tested surface; it should be smooth and carefully set; if a dent is produced in the sand it will be proved too soft-rammed.

The pressure of a fluid is regulated by the depth entirely, a 12-inch gate giving no more pressure, at a given depth, than a one-inch gate; or, in other words, a canal pushes against its bank as hard as an ocean, at the same depth. To make a simple and easily understood application of this pressure-rule we will suppose a mold of a plate 12 inches square, any thickness; the top or lifting surface will measure 12 times 12, or 144 inches. If now we raise the gate to four inches high the iron will lift 144 pounds full, but if we raise the gate higher, say, to eight inches, we get double the pressure—288 pounds of lift. That is more than the average molder would estimate it to be, at a rough guess, but it is a considerable fraction too low.

Two little instances from "away back" will shed a little light on the importance of this pressure rule, even in the handling of small, unimportant work. In 1848, at Niles & Co., a good general molder was pouring a trip-hammer face, about 20 inches square, five inches thick, with a tapering boss ten inches high, in the cope. I happened to be passing when he was pouring, and saw the iron shoot out at the joints and stop when the cope boss was partly emptied of iron and the lifting pressure reduced. Johnny looked dazed, astonished, helpless; so I called up some help, and added four weights to the two he had put on that 30-inch deep cope, then told him it was all right now, when he filled and saved his job, it being "chunk" enough to stand such a delay in pouring. When the fun was over Johnny said he thought those two weights would hold down any 30-inch flask. "Oh, no," I replied; "you need a better rule than such guessing."

He was astonished on showing him the figures, something like this: Top surface, 350 inches; gate at least 12 inches high; three pounds to the inch, giving a lifting pressure of 350x3—1,050 pounds. The six weights were about 200 pounds each, or 1,200 pounds, about the right surplus. This estimate is made when the gate is only two inches above the casting—very low.

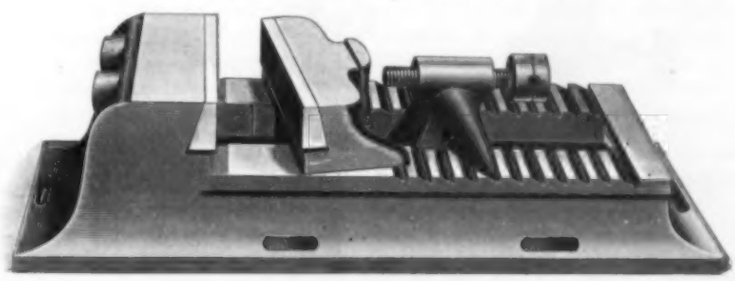
The other sample of bad guessing occurred in 1874, 26 years later, but was no more creditable to the parties concerned. On looking through the machine shop of the T. McG. Pump Co., and seeing a fly-wheel set up and painted—a part of a duplex pump set—carrying numerous marks of the chisel and putty knife, I asked the leading molder about its history. Tom made a long smile, then replied: "That is the second one." I replied: "I thought it ought to be the first."

That fly-wheel was about six feet in diameter and weighed about a ton. It was bedded in the floor, and had to be weighted down. The pour was through an ample sand trough reaching to the side, say about four feet long, and easily holding several hundred pounds. The pouring gate was very small, purposely, to catch the dirt and make a clean hub, and in that respect must be rated a success, as that ample trough was booming full when the end came.

Tom testified that he raised the feeder to about 16 inches high—such a heavy little wheel. The proprietor being present at the pour, offered to watch for the "up," placed himself over the riser, looking as innocent as Galatea when playing the marble statue, watched the iron rise up, up, and before that 16 inches of head was full, was astonished to discover another up, somewhat unexpected; that is, the cope jumped up with that enormous load of pig iron probably four times the required amount and let that several hundred pounds of iron in basin and head run out. Four inches of head in the riser would have been sufficient, but they gave it four times that amount; but the strangest fact is, that at a court-martial of boss and molders it was decided to have been caused by want of weight! And they weighted the next so enormously that it crushed all over.—[Iron Molders' Journal.

PLANER CHUCK AND DRILL PRESS VISE.

The vise illustrated herewith is made in various sizes for planer and drill press work, and several advantages are secured by this form of construction, which will be recognized as valuable features. Any work being chucked is given a



slight downward movement, the under surface of the work always being on the same plane as the upper surface. The obvious advantage is that work when planed, shaped or drilled may be depended upon to be true with its under surface. An equal grip is given to the work even when it is taper. The loose jaw can be rapidly adjusted to various sizes of work. In the smaller sizes of these chucks the slot running through the center of the vise allows the drill to pass through. Particulars will be furnished by the Massey Vise Co., 35 and 37 South Canal st., Chicago, which manufactures these vises and also a large line of bench vises.

At the Mountain Iron mine about 25 acres are now stripped and stripping work is still being done by three steam shovels. It is estimated that at least 80 acres of ore body that can be stripped will finally be developed at this property. It is stated by the *Mesaba Range* that so far as drainage is concerned the steam shovels can be used in mining for 40 feet deeper, a creek near by giving drainage to that depth. "There is some probability that a portion of the ore on the west side of the mine will have to be mined underground, but that will be done cheaply by driving drifts into it from the cut after it is about 40 feet deeper. But it will be several years before it will be necessary to go underground or even to resort to the milling system." The 90-ton steam shovel loads an average of 240 cars, day and night shift, and has much idle time. Recently 130 cars were loaded in five hours, which is the best work yet done.

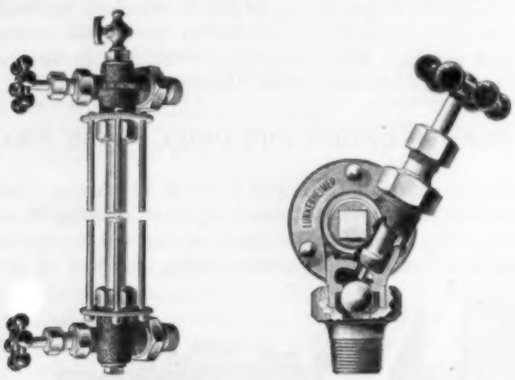
THE American Pig Iron Storage Warrant Co. had 238,900 tons in yard Aug. 10, 7,800 tons having been put in in the preceding 10 days and 1,400 tons taken out.

AUTOMATIC WATER GAUGE.

The cuts show the construction of the Lunkenheimer automatic water gauge, designed with a view to shutting off, the water promptly from gauges when the glass breaks, avoiding the danger and annoyance attending the closing of valves attached to gauges. When the valves are full open and the gauge glass is filled with water, the pressure on both sides of the ball valves will be equal and they will remain off their seats, but if the glass breaks, the sudden rush of water through the gauges will cause the balls to close against their seats, thereby shutting off water and steam.

The valves are put at an offset to the body, thus placing them out of the way, permitting of renewing glasses under full steam pressure. Another feature is the method of making the gauge either right or left hand, as may be desired. This is done by reversing the plugs at top and bottom of gauges, when the position of the gauge can be changed.

While steam pressure is on to preserve the automatic feature, the valve stems of both gauges are screwed back as far as they will go, so as to allow ball valves to act promptly when occasion requires. These gauges are made of gun metal composition. There are two sizes, one with one-half inch pipe thread and one with three-quarter inch pipe thread. Both have three-quarter inch glass. They are made with iron



EXTERIOR OF COMPLETE GAUGE. SECTIONAL VIEW OF UPPER GAUGE.

wheels or wood wheels. The manufacturers are the Lunkenheimer Company, Cincinnati.

Larger Rolls for Tin Mills.

The preference for larger rolls in tin mills is becoming stronger. There are now four tin plate plants in the country in which there are one or more stands of rolls 26 inches in diameter. In one works the whole plant is equipped with 26 inch rolls. In a plant being built at least half the tin mills will be equipped with 26-inch rolls, with provision for putting 26-inch or even 28-inch rolls in the whole plant. The tin plate makers who have adopted 26-inch rolls are generally those who have had several years experience with 24-inch or smaller rolls, and are therefore well equipped for forming a judgment as to the merits of different sized rolls. Besides increasing the diameter of the roll, there is a decided tendency to increase the length, and thus permit of the rolling of wider packs, and at the same time reduce the temperature of the whole roll, and especially of the necks. There is thus a considerable reduction in the danger of breakage, and an increase in the efficiency of lubrication due to the lower neck and brass temperature. The ability to roll wide packs is an advantage not only in cases where especially wide tin plate is called for, but also in cases where narrow plates are specified, and two or three widths, side by side, can be rolled in one wide pack.—[Tin and Terne.

PRESIDENT M. E. INGALLS, of the Big Four says: "I never saw a bigger demand for cars at this season than there is right now. Pig iron used to be a good barometer of trade conditions, but it is not so reliable now as some other things, bank clearings, for instance, and the movement of loaded cars."

THE production of pig iron in Germany for June, 1897, was 542,303 tons, against 579,613 tons in June, 1896. For the first half of 1897 the output was 3,341,815 tons; in the first six months of 1896 it was 3,095,805 tons.

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

A co-operative foundry company has recently been organized by 20 employes, molders, mounters and others, of the Favorite Stove Co., of Piqua, O. The new concern has secured a site in Daleville, Ind., and having bought the patterns of the Girard Stove Co., of Youngstown, O., will go into the manufacture of stoves and ranges as soon as a factory building can be completed.

A new tin plant is talked of at Shamokin, Pa. H. S. Strouse represents the capitalists interested.

The Griffin & Barnes Machinery Co. has been incorporated at Austin, Texas, by T. J. Griffin, S. W. Barnes and H. Riedel, the capital stock being $10,000.

The Jeanesville Iron Works Co., of Jeanesville, Luzerne County, Pa., has been incorporated, with a capital of $200,000, by J. C. Hayden, Vernon H. Rood, A. Bartholomew, Samuel Garner, T. M. Morris.

Becker Milling Machine Co., of New York City, has been organized to manufacture milling machines and machine tools, with a capital of $25,000. The directors are George Becker, and Philip Becker, of Brooklyn, and W. J. Thompson, of New York City.

The Foundry Investment Co. has been organized at St. Louis, Mo., with a capital stock of $40,000, by David Rankin, William H. Thomson and F. Churchill Wittemore.

The Underwood Motor Co., of Sandusky, O., has been incorporated, with a capital stock of $100,000, to engage in the manufacture of stationary, portable and marine engines.

The New Jersey Valve Co., has been organized at New Brunswick, N. J., by Robert Strong, of Plainfield, A. H. Strong, of Metuchen and James L. Stewart, of Montclair, N. J.

The Parkhurst-Wilkinson Co., of Chicago, has been incorporated with a capital stock of $300,000, for the purpose of manufacturing, purchasing and selling steel, iron, hardware, wagon material, mining supplies, etc. The incorporators are Arthur J. Eaton, Anson H. Watson and Henry J. Warner.

The Atlanta Machine Works, Atlanta, Ga., asks prices on a 60 to 75-h. p. Corliss engine.

The Standard Boiler & Bridge Co., Bellaire, O., is in the market for a power punch sufficient to punch one and a quarter inch holes through inch plate; second-hand will do.

New Construction:—

The new Dubois Iron Works, at Dubois, Pa., was put in operation for the first time last week. The principal building, now completed, is 500x80. Other buildings and additions are contemplated.

A new plant for the manufacture of enameled bath tubs is talked of at New Castle, Pa., and property has been donated for a site. Pittsburg and eastern capital is interested.

The Structural Iron Co., with which J. W. Leroux and W. L. Lauer are identified, will erect a new plant for building bridges and structures at South Paca and Gunpowder streets, Baltimore, Md.

The Chicago, Burlington & Quincy expects to begin work about Sept. 1 on a new steel bridge across the Mississippi river at Quincy, Ill., to replace the present structure, which was erected in 1873. The new bridge will be erected a span at a time, so as not to interfere with traffic, and it will take about a year to complete the work. R. J. McClure, consulting engineer, Chicago, is now completing the plans and the contract for the iron work has not yet been let. The new bridge will be a single track structure and will be built on the old abutments.

At Dansville, N. Y., the George Sweet Mfg. Co. will soon begin the building of new shops. These include a 56x00-ft. foundry, a 64x36-ft. machine shop, a wood-working shop, 36x80 ft., and a new boiler house.

At Sing Sing, N. Y., John W. Sullivan, builder of marine engines, is about to start his newly erected foundry. A large traveling crane is part of the equipment.

Additions, Enlargements, Removals, Etc.:—

The Hamilton Tool & Construction Co., of Hamilton, O., is reported to be considering the removal of its factory to Lib-

Because our Fathers and our Forefathers did—

Just because it has been the proper thing in the past to use a closed feed-water heater in rolling mills, blast furnaces and other large plants—it is no reason why we should take our bricks up in a hod on our back, when an endless chain worked by steam will do it for us at a smaller cost—or that we should burn tallow dips if we can obtain a better effect by turning or pressing a button—and similarly, some concerns in the iron and other industries are coming closer to present day practice by trying—just trying—**COCHRANE FEED-WATER HEATERS.**

From our lists of those who are "trying" these appliances we present the following names:

Ohio Steel Co.; Shoenberger Steel Co.; Oliver Wire Co; Oliver I. & S. Co.; Reeves I. Co; Clinton I. & S. Co.; Monongahela Furnaces; Weston Furnaces; Consolidated Wire & S. Co.; Firth-Sterling S. Co.; National Foundry & Pipe Co.; National Tube Works; Phosphor-Bronze Smelting Co.; Sterling Iron & Railway Co.; National Galvanizing Works; Sharon Iron Co.; Oliver-Snyder Steel Co.

Yours for hot feed-water—real purification and **OPEN HEATERS,**

HARRISON SAFETY BOILER WORKS, Mfrs.; Phila., Pa.

ertyville, Ill., on the Chicago, Milwaukee & St. Paul Railroad. Plans have been prepared for a two story brick building, 60x140 feet. The company manufactures ice tools and bridges.

The Pratt Chuck Co., of Clayville, N. Y., have leased the West Shore blacksmith shop at Franklin, N. Y. It is a brick building, 196x75 feet, with a boiler house and two wooden structures.

The American Wire Nail Co., at Anderson, Ind., has purchased additional ground adjoining its plant for the purpose of extending its facilities.

The Standard Mfg. Co., of Allegheny, Pa., has secured a permit to build an addition, 228x60 ft., to its Preble ave. plant, to cost $9,300. It will be used as a warehouse.

Fires and Accidents:—

The plant of the Cedar Rapids Iron Works, at Cedar Rapids, Ia., was damaged by fire recently.

General Industrial Notes:—

The old mill department of the plant of the Pittsburg Tin Plate Works, New Kensington, Pa., resumed operations last week. Within the next few days this concern will have in operation a complete plant containing six mills and will give employment to about 500 hands. The plant was closed down during July to enable the company to make changes in the old mill to harmonize with the new arrangements.

The annual meeting of the stockholders of the Firth-Sterling Steel Co. will be held in Pittsburg, Tuesday, Aug. 24.

The Consolidated Steel & Wire Co. is preparing to put in operation the Enterprise wire mill, at Joliet, Ill. This mill is one of the finest in the country and has only been operated in part and for a short time since the failure of Fish Bros., in 1892. Not since its purchase in 1894 by the Consolidated company until now have the times been favorable for its operation in addition to its other plants.

The Sable Iron Works of Zug & Co., Ltd., at Pittsburg, are again in operation, though not quite to full capacity. Half of the puddling furnaces are in operation and the output is sufficient to meet present requirements of the bar mill. The concern has orders for a couple of weeks in this department, after which its operation will depend upon business received in the meantime. The sheet mill is very busy, having about three months' work on hand, and the facilities are being added to by the erection of producer gas furnaces, two additional stands of rolls, an electric crane, a pickling department, and a warehouse for storage.

The Pennsylvania Steel Co. has established a branch office in room 413 Western Union Bldg., Chicago, under the management of W. H. Stearns and A. F. Klink. Mr. Stearns was for three years general sales agent of the Buda Foundry & Mfg. Co.

The Stoner Iron Works, of Riverside, Cal., are to be equipped for making agricultural machinery.

The S. Obermayer Co., Chicago, manufacturer of foundry facings, supplies and equipments, reports business improving very good, being considerably better than at the corresponding time last year. Among recent orders taken were the following: Complete brass and iron foundry outfit for the Paul E. Berger Mfg. Co., Chicago Ridge, Ill.; complete brass foundry outfit for the Q. & C. Co., Chicago Heights, Ill.; and complete foundry outfit for the Chicago Building Iron Works, Chicago. These are all new concerns in the foundry business, showing that capitalists are more willing to invest in the metal and iron industries. The S. Obermayer Co. has also had many orders recently for foundry facings and supplies from its numerous customers in all parts of the civilized world.

The National Malleable Castings Co. has lighted the fifth furnace in its foundry at Haughville, an Indianapolis suburb. It has been three years since its business justified the operation of so large a part of the plant.

Arrangements have been perfected at Marion, Ind., to reopen the Westerman Rolling Mill, which failed a year ago and has been idle since. George R. Stewart, a local capitalist, has a contract with the stockholders to buy the plant at a stipulated price if after operating it until Jan. 1 it is shown the mill can be worked at a profit.

The furnace of the Buffalo Furnace Co., Buffalo, N. Y., has blown in.

The Chicago Pressed Steel Co. will start the rolling mill at Muscatine, Ia., Oct. 1.

The Tidewater Steel Works, Chester, Pa., which have been idle for a year, have been leased to the Chester Pipe & Tube Co., of Chester, and will roll skelp.

The plant of the National Water Tube Boiler Co., at New Brunswick, N. J., has started up.

An agreement has been filed at Trenton, N. J., for the consolidation of the Seamless Structural Tube Co. with the Phœnix Tube Co., of Jersey City, N. J.

The Lehigh Foundry Co., owner of the Blakeslee Foundry, South Allentown, Pa., has sold the property to the Midvale Foundry Co., which has been lessee of the plant for several years.

The firm of Fyans, Frazer & Blackway have purchased the tools and equipments of the Eugene McCarthy machine shop, Fall River, Mass.

The Riverside Forge Co. is to locate at Buffalo, N. Y.

The Birmingham Pipe Works Co., of Birmingham, Ala., has assigned to R. C. White.

Another No. 4 Gardner grinder has been shipped by Charles H. Besly & Co., 10 an 12 North Canal st., Chicago, to Brown & Sharpe Mfg. Co., Providence, R. I., making the fifth of these machines bought by this company. Besly & Co.'s factory at Beloit, is being pushed to its capacity on special tap work. Sales of their Helmet oil are larger than ever and export orders for Gardner die stocks are a feature of their trade. Inquiries for the fine catalogue recently issued are being received from many foreign countries as well as all parts of this country.

It is reported that arrangements are being made whereby a syndicate headed by Richard Sinclair, of Montpelier, Ind., will secure control of the Indiana Steel Casting Co., of that place, now in the hands of a receiver.

On the gun forgings for which bids were opened at Washington, Aug. 14, the Midvale Steel Co. and the Bethlehem Iron Co. bid as follows, respectively: Six sets of six-inch forgings,

MOUNT SAVAGE FIRE BRICK.

UNION MINING CO.,

Proprietors of the CELEBRATED Mount Savage Fire Brick

GOVERNMENT ‡ STANDARD.

Established 1841. Capacity, 60,000 Per Day; 18,000,000 Per Year.

The First Manufactory of its Kind in the U. S.

Home Office and Works:—MOUNT SAVAGE, Allegany County, Md.

Branch Offices:—No. 1 Broadway, New York, N. Y.; No. 222 So. Third St., Philadelphia, Pa.; Ferguson Block, Pittsburgh, Pa., Stowe, Fuller & Co., 195 Merwin St., Cleveland, Ohio.

SEMI-STEEL

Machinery Castings of All Kinds.

Cylinders, Rolls, Dies, Etc.

Castings Furnished Within Two Days After Receiving Patterns.

40,000 LBS. TENSILE STRENGTH.

GIVE US A TRIAL.

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THE SARGENT COMPANY.

OLD COLONY BLD'G. CHICAGO ILL. U.S.A.

ST. PAUL, TACOMA, PORTLAND. ST. LOUIS, CINCINNATI, SAN FRANCISCO.

OPENHEARTH STEEL CRUCIBLE CASTINGS.

OTIS STEEL

"OTIS" FIRE-BOX PLATES A SPECIALTY.

Flange Plates, Ship Plates, Tank Plates, Steel Car Axles and Forgings of all kinds.

Steel Castings from 100 to 75,000 lbs.

Head Office and Works, CLEVELAND, OHIO.

Agencies: NEW YORK, 97 Cedar St. CHICAGO, Old Colony Bldg.
ST. LOUIS, 516 N. Third St. WASHINGTON, Kellogg Bldg.
MONTREAL, J. G. Sibbald, 3 Windsor Hotel.
SAN FRANCISCO, John Woodlock, 26 Beale St.

26½ per lb., 26 cents per lb.; 25 sets of five-inch armor, 26½ cents, 26 cents; 15 sets of four-inch armor, 25½ cents, 26 cents.

At Milwaukee an attachment was issued against property of the Illinois Steel Co. on a claim for $60,539 in favor of the Newport Mining Co., for ore furnished. There was no interruption of operations. A $125,000 guarantee was furnished and the attachment was raised.

At the Pioneer Furnace of the Cleveland-Cliffs Iron Co., at Gladstone, Mich., a testing machine is being installed to make tests of the strength of the company's charcoal iron. This will make it possible to give buyers the physical properties of the iron in addition to the chemical properties heretofore furnished.

Active operation of the mower and reaper establishment of Aultman, Miller & Co., Akron, O., will begin Oct. 15. A start was made at these works the past year in the manufacture of the corn-harvesting machinery invented by Supt. Lewis Miller.

The J. W. McClurg Gas Co. will put in an artificial gas plant at East Liverpool, O.

The Diamond State Iron Co., of Wilmington, Del., has taken an appeal to the United States Circuit Court of Appeals from the decision recently rendered against it in its patent litigation with Dilworth, Porter & Co., of Pittsburg.

After the fire a short time ago, which damaged the machine shop and pickling and tinning departments of the Avery Stamping Co., Cleveland, repairs were made at once and the company is now in position to take care of orders without delay.

The Salem Wire Nail Co., Salem, O., refused to sign the wire-drawers' scale and demanded 12½ per cent reduction. The men are out and the company is planning to introduce a new system of wire-drawing.

The receiver for the Columbiana (O.) Pump & Machine Co. has sold the plant to the Pittsburg Pump Co. for $8,000. The new owners will enlarge the works and erect a large warehouse.

It is telegraphed from Elwood, Ind., that 500 boxes of tin plate were shipped to Italy by the American Tin Plate Co., last week.

The blowing in of Oxmoor Furnace makes 15 now active in the Birmingham district, with a daily output of 2,600 tons. This is the largest number of furnaces in blast there since 1892.

The Wm. Cramp & Sons' Ship & Engine Building Co. has brought suit against the Government to recover $1,736,149 damages alleged to have been incurred by the company in building the battleships Massachusetts, Iowa and Indiana, and the cruisers New York, Brooklyn and Columbia, due to

U. BAIRD MACHINERY CO.

123 AND 125 WATER STREET, **PITTSBURG, PA.** 124 AND 126 FIRST AVENUE.

MACHINE TOOLS AND SUPPLIES.

Some SECOND-HAND TOOLS in stock.

1—8-ft. Boring Mill.
1—No. "D" Horizontal Boring & Drilling Machine.
1—Garvin Profiler.
1—A. T. & M. Co. Valve Milling Machine.
4—No. 11 Brown & Sharpe Milling Machines.
2—No. 1½ Stiles Presses.
1—No. 3 Stiles Press.
1—36-in. G. & E. Spur Gear Cutter.
2—Crank Planers.
3—No. 1 Brown & Sharpe Screw Machines.
2—No. 6 Brown & Sharpe Screw Machines.
1—36-in. Car-wheel Borer.
1—55-in. Pneumatic Riveter.
1—30-in. Pulley Lathe.
1—Pratt & Whitney Turret Lathe.
1—109-in. Engine Lathe.
1—15-in. Fox Turret Lathe.
1—20-in. Lodge-Davis Turret Lathe.
1—20-in. x 10-ft. Gleason Engine Lathe.
1—24-in. x 12-ft. Gleason Engine Lathe.
1—3-Spindle Drill Press.
2—30-in. Drill Presses.

EDWARD E. ERIKSON,
CONSULTING AND CONTRACTING ENGINEER.
Steel Plants, Sheet and Tin Plants, Gas Furnaces and Producers Structural Iron and Steel.
Automatic Billet Heating Furnaces. Plans and estimates furnished.
CONESTOGA BLDG., PITTSBURG, PA.

SILICA BRICK
For Iron and Steel Furnaces, Glass Furnaces, etc.
SPECIAL SHAPES MADE TO ORDER.
DIAMOND FIRE BRICK WORKS,
AKRON, OHIO.

delays and defaults of the United States in furnishing armor plate and plans.

The mills of the Cherry Valley Iron Works, Leetonia, O., started last week after a long idleness.

The Eagle Iron & Steel Co.'s mill at Ironton, O., started up last week.

Delaware Iron Works, at New Castle, Del., have resumed after a six-weeks' shut down.

The Cleveland Rolling Mill Co.'s steel works are now active in all departments, over 2,500 men being employed. The No. 5 and No. 6 furnaces are in blast, making over 600 tons a day.

The Lalance & Grosjean Mfg. Co. has dismantled its forge at Harrisburg, Pa. One or two tin mills may be put in the space.

A charter has been issued to the Isabella Furnace Co., of Allegheny City, Pa., with $1,250,000 capital. The incorporators and directors are Augustus E. W. Painter, Park Painter, Augustus Chalfant and George Chalfant.

The Hoffman-Billings-Weller Pipe Co., of Gadsden, Ala., formerly of Milwaukee, has an order which will keep the plant in operation for two years. The plant will be enlarged and 125 extra men will be put to work.

The litigation between the Leechburg Foundry & Machine Co., Pittsburg, and the Reeves Iron Co., of Canal Dover, O., growing out of the use by the latter of a pickling machine which it was claimed infringed on the Mesta patents, has been settled by the Reeves Iron Co. paying a consideration for the right to continue using the machine and paying the court costs.

At Indianapolis, stockholders of the Irondale Steel & Iron Co., of Middletown, Ind., have filed suit for a receiver. They allege that the affairs of the company are involved and that some $200,000 of assets are in danger of being dissipated.

At Youngstown, O., the Mahoning Valley Iron Co. is operating this week its 9, 12, and 16-inch mills; both puddle mills, the large plate mill, the nail plate mill, the nail plate factory, and shafting works. The 7 and 18-inch mills are the only idle departments. The plant of the Andrews Bros. Co., at Haselton, is operated in full. Its Haselton furnace was started Aug. 14. Both the upper and lower mills of the Union Iron & Steel Co. are operated for the most part. Brown, Bonnell & Co.'s plant, excepting the plate mill and No. 2 puddle mill, is on. The Ohio Steel Co. continues to run full.

The first of the three engines the St. Louis Iron & Machine Works Co., St. Louis, is building for the Consolidated Steel & Wire Co.'s Rankin, Pa., plant is now being shipped. It is of the cross compound condensing type, the cylinders being of 32 and 58 inches diameter, with 60-inch stroke. It will run at 80 revolutions a minute and with steam at 125 lbs. initial pressure will develop 2,000 h. p. Double eccentrics are provided for each cylinder for operating the valves which control the admission of steam to the cylinders, independently of the valves which control the exhaust. The main shaft is 22 inches in diameter and 32 feet long and will weigh, with the two steel cranks and pins, 32,000 lbs. The wheel has a triple set of arms, is 24 feet in diameter, has a 9-foot face, and has 48 grooves for manilla rope. The wheel alone will weigh over 150,000 lbs. and the engine complete, including the great wheel, will weigh 380,000 lbs. The condensers for the engines will be arranged as a central condensing plant near the Monongahela river and will consist of three independent steam driven jet condensers, and having steam cylinders 14 inches in diameter by 24-inch stroke, and air cylinders 30 inches in diameter by 24-inch stroke.

The plant of the Ranken & Fritsch Foundry & Machine Co., St. Louis, sold recently under first mortgage bonds, amounting to $66,000, was bought for $40,000 for the bondholders who made application for articles of incorporation for the Foundry Investment Co., with a capital of $40,000.

The Ohio Iron & Steel Co., Lowellville, O., put its furnace in blast this week after repairs.

The Harrisburg Rolling Mill Co., Harrisburg, Pa., has received orders for 600 to 700 tons of skelp for export to England in the past year, and further trade is expected in view of the satisfaction the metal has given.

The Addyston Pipe & Steel Co., Cincinnati, had the largest pay-roll in its history, last week.

Lindsay & McCutcheon's rolling mills in Allegheny are running double turn and additional men have been put on.

The Amalgamated Association has organized a lodge at Lisbon, O., among the employes of the New Lisbon Tin Plate Works. It is reported that 50 of the men have been discharged.

The Alabama Rolling Mill Co., Gate City, Ala., resumed operations Aug. 16 in its rolling mill; 700 men are employed.

The Gate City Land Co., Gate City, Ala., has a proposition from New Orleans, local and foreign capitalists, that if a site of 20 acres is donated they will erect a $1,000,000 steel plant at Gate City, and agree to supply a customer for 100 tons of steel daily, referring doubtless to the Gate City Rolling Mill Co.

The Moore Mfg. Co., Milwaukee, whose specialties are chain hoists, steel door hangers, door rails, etc., inform us that the offices and plant will be moved to Cleveland, O., this month, into the works of the HP Nail Co. The company name and distinct organization will be retained under the management, as heretofore, of E. Y. and V. M. Moore, but the interests of the two companies have been so harmonized and identified that the Moore Mfg. Co. practically becomes a department of the HP Nail Co. Making its products direct from the billet, all the processes in its own works, and in the very home of the steel industry, the company is in a more advantageous posi-

tion than ever. The capital of the Ohio incorporation is $50,000. The incorporators are S. H. Chisholm, E. Y. Moore, Wm. E. Cushing, A. L. Juilliard, and John H. Clarke. For the present correspondence should still be addressed to Milwaukee.

E. N. Ohl and W. E. Reis, receivers of the Atlantic Iron & Steel Co., of New Castle, received permission last week from the court to pay interest upon outstanding notes for $85,500 for 60 days, amounting to $1,000. The notes are secured by mortgage bonds of the company.

The Brilliant Tube & Iron Works, Brilliant, O., having been sold to the trustees for the first mortgage bondholders, as heretofore reported, an effort will now be made to sell it at private sale to some company or person who will operate it.

The Warren, O., mill of the Union Iron & Steel Co., of Youngstown, O., is expected to start Sept. 1 in all departments.

Locomotive and car building: It is stated that the Imperial Railways of Japan will probably order 130 or more locomotives before the work of double tracking the roads is finished. The St. Charles Car Co. is building 32 freight cars for the Interoceanic Railway, of Mexico and 15 freight cars for the Kaslo & Slocan Railway. The Burlington, Cedar Rapids & Northern has ordered from the Wells & French Co., of Chicago, 200 box cars. The Michigan-Peninsular Car Co., of Detroit, Mich., will build 50 refrigerator cars for Swift & Co. The Ohio Falls Car Mfg. Co., Jeffersonville, Ind., is building 20 freight cars for the Rio Grande, Sierra Madre & Pacific. The Ensign Mfg. Co., of Huntington, W. Va., has an order to build 55 refrigerator cars for the Southern Pacific. The Kansas City, Pittsburg & Gulf has placed an order with Barney & Smith Car Mfg. Co., for 250 box cars.

Before the shut-down in June, the Mahoning Valley Iron Co., of Youngstown, O., served notice on the employes in its plate mill that their services would be dispensed with. It was expected at that time that the mill would be closed down, as the men would not make concessions to put it on an equality with Pittsburg. The Amalgamated scale, recently signed settled the rollers' and heaters' wages. The wages of the other workmen have now been arranged on a reduced scale and the mill has been prepared for resumption.

The Perkins Machine Co., whose salesroom is 160 Oliver st., Boston, has moved into its large and well equipped factory at South Boston, and is now in position to design or build any type of power press wanted and to do all kinds of heavy work, including regular and special machinery New features have been added to the 1898 Perkins power presses, giving greater strength and enabling it to do heavier work. The die department is equipped with latest machinery and gear-cutting and pattern-making are also specialties.

The conferences held during the last week by the puddlers at the National Tube Works resulted in a decision to return to work at $4. The company agreed to pay the prevailing rate—$4 as long as other mills did the same but refused to sign the Amalgamated agreement. The puddling furnaces have been idle for three months as a result of the strike.

The Lucknow Forge, near Harrisburg, one of the few bloomaries in Pennsylvania, has started up again after an idleness of four years.

The pumping station of the Erie, Pa., water works will be

"Metallurgy of Cast Iron,"

By THOS. D. WEST; 107 engravings, 583 pages. Just issued. A valuable work to Founder, Molder, Draughtsman, Designer, Technical School Specialist. Chemistry of Iron; cheaping of mixtures; the effect of the metalloids in changing the grade of iron; latest improvements in cupola construction and practice—all are fully covered. Price $3. Sent postpaid on receipt of price, by *The Iron Trade Review Co.*, Cleveland, O; 1142 Monadnock Block, Chicago, Ill.

James M. Swank, author of "Iron in All Ages," and editor of the *Bulletin* of The American Iron & Steel Association, in reviewing "Metallurgy of Cast Iron," says it is "One of the most valuable publications relating to the manufacture of iron castings, that has ever, to our knowledge, been issued in this or any other country."

DOES YOUR ROOF LEAK?

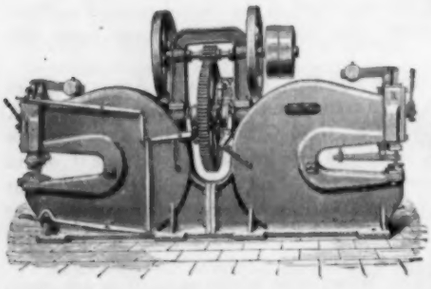
If an old leaky tin, iron or steel roof, paint it with Allen's Anti-Rust Japan. One coat is enough; no skill required; costs little; lasts long.

The name describes it; proof against water, time, climate, and fumes of every description. Stops leaks, and prolongs the life of an old roof.

If you want evidence write us. To be returned at our expense if not satisfactory.

This Anti-Rust is also of highest value in protecting metal pipes, fans, etc., at mines, exposed to the corroding effects of *mine air* and *mine water*.

ALLEN ANTI-RUST MFG. CO.,
413 Vine St., Cincinnati, O.



THE LONG & ALLSTATTER CO.,

HAMILTON, OHIO,
MANUFACTURERS OF
POWER PUNCHING AND SHEARING MACHINERY.
Belt, Steam or Electrically Driven.
For Heavy or Light Work.

NON-ARCING AUTOMATIC CIRCUIT BREAKERS

GUARANTEED TO OPERATE PERFECTLY OR NO PAY. MADE FOR ALTERNATING OR DIRECT CURRENT. ANY VOLTAGE. CATALOGUE FREE.
AUTOMATIC CIRCUIT BREAKER COMPANY, NEWAYGO, MICHIGAN, U. S. A.

equipped with eight new boilers. A new pump will be added later.

Bids were opened by the U. S. Government recently for a large equipment of machinery for the Navy Yards at Port Royal, S. C. The Davis & Egan Machine Tool Co., of Cincinnati, was awarded the contract for several of the machine tools.

SEASHORE EXCURSION.

Via Pennsylvania Lines This Summer.

General excursions to the seashore at exceptional low rates will be inaugurated by the Pennsylvania Lines this summer, offering grand opportunity for delightful outings at the most popular ocean resorts on the continent. This announcement will be good news to persons who may desire to enjoy their vacation at the seaside. They may visit Atlantic City, Cape May, Avalon, Sea Isle City, Anglesea, Ocean City, Holly Beach or Wildwood at very low fare, round trip tickets to either resort being obtainable at the same rate.

The first excursion will be run Thursday, July 15th, followed by a second four weeks later, Thursday, August 12th. Round trip rates to either Atlantic City, Cape May, Avalon, Sea Isle City, Anglesea, Ocean City, Wildwood or Holly Beach, New Jersey, will be $12.50 from Ft. Wayne and Toledo; $12 from Lima, Crestline, Tiffin, Mansfield; $11.50 from Orrville, Cleveland, Canton, Massillon, Youngstown, Girard, Niles; and $11 from Alliance.

The return limit will cover 12 days, including date of sale, which will be ample for customary ten days' vacation. For further desired information, address C. L. Kimball, Assistant General Passenger Agent, Cleveland, O., for particulars. Illustrated description of resorts to which excursion tickets will be sold, with list of hotels and boarding houses at each, will be furnished upon application.

LOW RATES.

Via Pennsylvania Lines.

Special reductions in fare over the Pennsylvania Lines will be granted for numerous events to take place this summer in various parts of the United States, in addition to local excursions. Some of the points to which tickets will be sold and dates of sale are as follows:

To Nashville, Tenn., daily to October 15th, for Tennessee Centennial and International Exposition.

To Winona Assembly Grounds, Eagle Lake (near Warsaw, Ind.), May 15th to August 31st, for Annual Assembly and Summer School.

To Indianapolis, September 8th and 9th, for National Encampment Sons of Veterans.

The reduced rates over the Pennsylvania Lines will not be restricted to members of the organization mentioned, but may be taken advantage of by the public generally. Excursion tickets may be obtained at ticket offices on the Pennsylvania System and will be sold over this route by connecting railways. Any Pennsylvania Line Ticket or Passenger Agent will furnish desired information concerning rates, time of trains, return limit, and other details to all applicants, or the same may be obtained by addressing C. L. Kimball, Assistant General Passenger Agent, Cleveland, O.

Merchants' Excursion to New York and Philadelphia.

On August 27th, 28th, 29th, 30th and 31st the Pennsylvania Lines will have cheap excursions to New York and Philadelphia for merchants. For praticulars apply to nearest Pennsylvania Line ticket agent, or address C. L. Kimball, Assistant General Passenger Agent, Cleveland, O.

THE Commissioner of Labor estimates that last year in the 12 leading cities of Ohio there were 76,500 unemployed, and this year the unemployed number 39,400. In Cincinnati, last year, the number was 18,000 to 20,000 and this year 10,000 to 12,000; in Cleveland last year, 15,000 to 18,000 and this year 9,000 to 10,000.

A Lake Tour to the Island of Cool Breezes.

Go to Mackinac Island, Mich., via the Coast Line. The D. & C. new steel passenger steamers leave Toledo, Mondays and Saturdays, 10.30 A. M., and Tuesdays and Thursdays, 4.30 P. M. From Detroit, Mondays and Saturdays, 11.00 P. M., Wednesdays and Fridays, 9.30 A. M. Send two cents for illustrated pamphlet. Address A. A. Schantz, general passenger agent, Detroit, Mich.

Steam Yachts and Marine Machinery.

Also Towing Launches built by Marine Iron Works, Clybourn and Southport avenues, Chicago. Free illustrated catalogue. Write them for it.—*Adv.*

The A B C of Iron

A book for foundrymen. It is issued in cloth binding, and gives much valuable matter on how to reduce cost of mixtures, and on grading and numbering of pig iron.

CHAPTER HEADINGS:—Iron—What is it? Pig Iron. Constituents of Iron. Numbering of Pig Iron. Grading of Iron. How to reduce cost of mixture. Steel. Physical Properties of Metals Defined, Statistics. Early History and Manufacture of Iron.

FORMER PRICE, $2.00

NOW -:- $1.00.

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THE IRON TRADE REVIEW CO.,

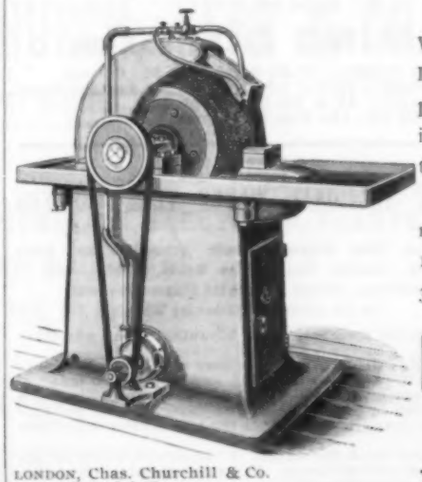
27 Vincent St., CLEVELAND.

FOR SALE, CHEAP SECOND-HAND TOOLS.

5—14 ins. x 6 ft. Lathes. 2—14 ins. x 8 ft. Lathes. 3—16 ins. x 6 ft. Lathes. 1—10 ins. x 8 ft. Lathe. 2—18 ins. x 6 ft. Lathes. 6—18 ins. x 8 ft. Lathes 3—18 ins. x 10 ft. Lathes. 1—18 ins. x 12 ft. Lathe. 1—22 ins. x 12 ft. Lathe. 3—24 ins. x 12 ft. Lathes. 1—26 ins. x 12 ft. Lathe. 1—26 ins. x 14 ft. Lathe. 1—26 ins. x 16 ft. Lathe. 1—30 ins. x 12 ft. Lathe. 2—52 ins. Radial Drills. 2—80 ins. Radial Drills. 36 ins. x 36 ins. x 16 ft. Planer, Double Head.

All of these tools are the latest improved and just as good as new, and can be seen at our ware-rooms on Second Street, Cincinnati.

Dietz, Schumacher & Boye, Cincinnati, O



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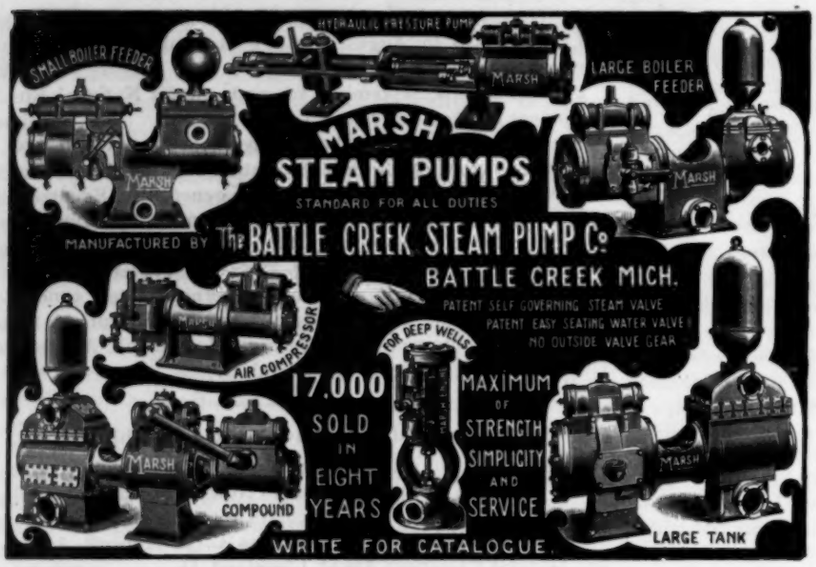
Don't grunt over a grindstone. Buy a Water Tool Grinder using an emery wheel. It cuts clean and does the work quick. The pump delivers water just where you want it, in front or on either side. The settling tank provides clean water, not mud.

These grinders save time (which is money). Made in 6 sizes to carry wheels 14 x 2; 18 x 2½; 30 x 2½; 24 x 3½; 30 x 4; 36 x 4.

Diamond Machine Co.

PROVIDENCE, R. I.
U. S. A.



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NEW YORK.

Boston. Philadelphia. Chicago. Cleveland. St. Louis. Indianapolis. Detroit. Atlanta. Pittsburg.

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OF THE

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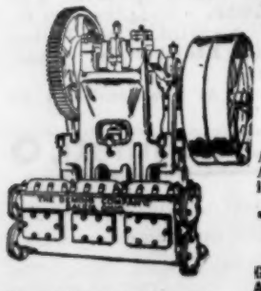
Will be sent postpaid by *The Iron Trade Review* at $6.

Is a thorough revision of the list of blast furnaces, rolling mills, Bessemer and Open-Hearth steel works, plate and sheet mills, nail mills, tin plate mills, malleable, cast iron pipe and wrought pipe works, car wheel and locomotive works.



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Four Types and Eight Sizes for ELECTRIC AND OTHER POWER.
SINGLE AND DOUBLE-ACTING CYLINDERS.

Unequaled in Design and Construction.

Adapted for Water Works, Hydraulic Elevators, Boiler Feeding, Apartment Houses, Mine Pumping, Irrigation, Paper Mills, Refineries, Breweries, Etc. MADE BY

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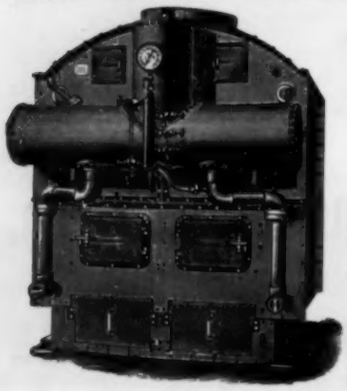
General Agencies: HENION & HUBBELL, 61-69 N. Jefferson St., Chicago. HARRIS PUMP & SUPPLY CO., 320-322 2nd Ave., Pittsburg. W. P. DALLETT, 49 N. 7th St., Philadelphia. C. J. JAGER CO., 174 High St., Boston.



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PATENT SECTIONAL WATER TUBE BOILERS

FOR

Steamships, River Steamers, both propellers and stern wheels, Torpedo Boats, Fire Boats, Yachts and Launches, Donkey Boilers for Steamships, and for all kinds of Stationary Work.

This Boiler possesses more advantages than any other Boiler.

It has STOOD THE TEST of over seven years' constant daily use in passenger steamers, and is in use in many of the best steam yachts. It has proved its durability to be equalled by none. It has shown from 10 to 15 per cent saving in every day work over the best Marine Fire-Tube Boiler.

It is one-third the weight of the Scotch Boiler for the same power and efficiency. It is non-explosive. No priming, and easy to manage.

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178-184 Allen's Ave., near Rhodes St., PROVIDENCE, R. I.

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Safety Hoist

saves Time and Work, prevents Accidents and is Efficient and Simple. All sizes from ¼ to 15 tons capacity kept in stock, insuring prompt shipments.

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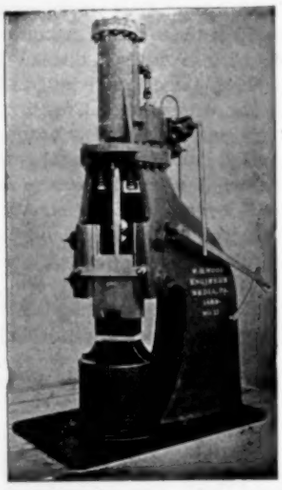

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Philadelphia and New York	*1:40 pm	*11:25 am
Baltimore and Washington	*1:40 pm	*11:25 am
Alliance and Pittsburgh	*1:40 pm	*11:25 am
Ravenna and Alliance	*5:00 pm	*8:40 am
Philadelphia and New York	*11:10 pm	*4:30 am
Baltimore and Washington	*11:10 pm	*4:30 am
Alliance and Pittsburgh	*11:10 pm	*4:30 am

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FROM CLEVELAND TO	LEAVE	ARRIVE
Xenia and Cincinnati	*8:50 am	*5:30 pm
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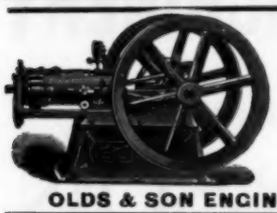

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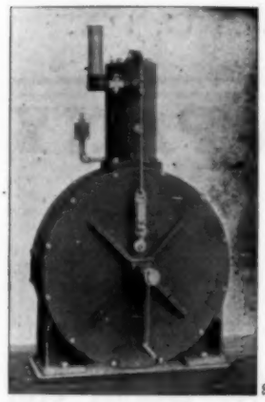

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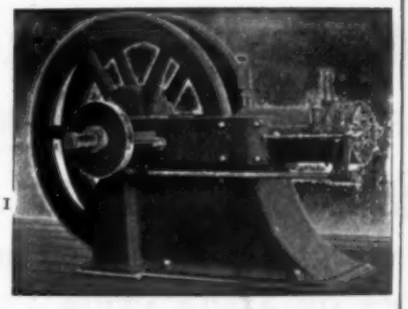

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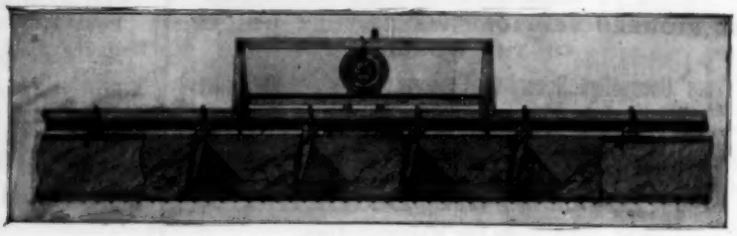

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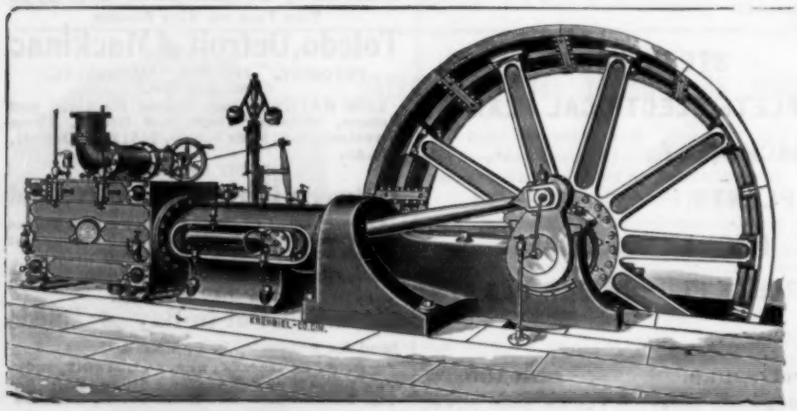

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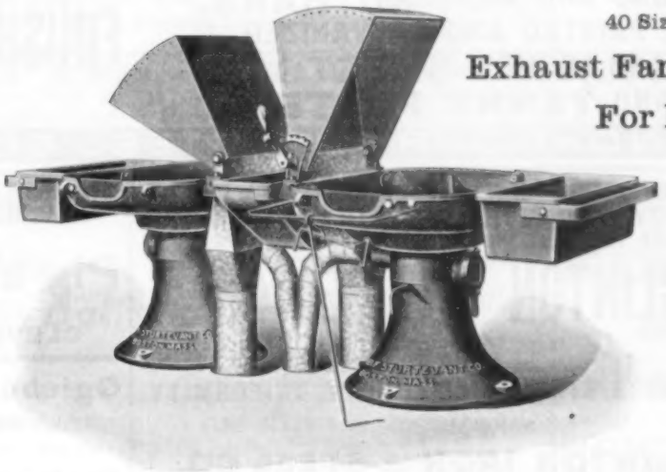

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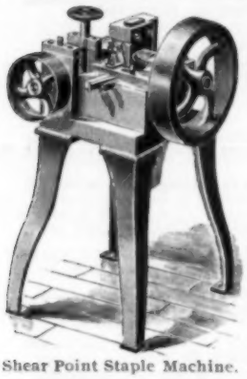

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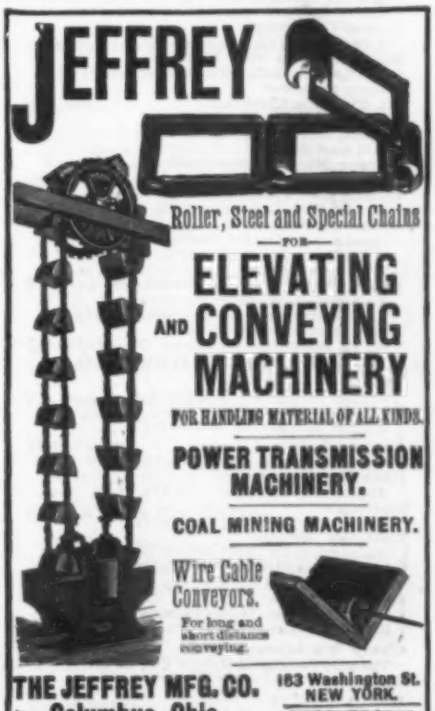

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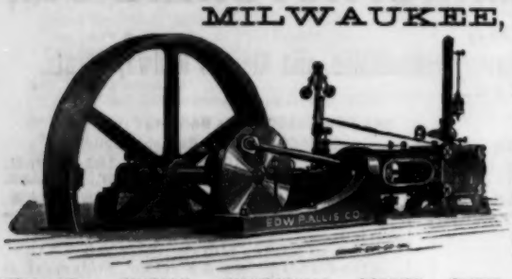

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Phillips Testing Laboratory, The	27
Pickands, Brown & Co	2
Pierce-Crouch Engine Co	23
Pittman, C. K	2
Pittsburg Tool Steel Co	27
Pollock, Wm. B. & Co	2
Playford Stoker Co	34
Prouty Co., The	2
Pullman, J. Wesley	26
Rand Drill Co	2
Rand, Chas. F., Prest	26
Reading Crane & Hoist Works	22
Reese, Hammond & Co	36
Rockwell & Co., W. S	33
Rogers & Hubbard Co	27
Sargent Co., The	18
Seaman, Sleeth Co	26
‖Sharon Fire Brick Works	1
Shiffler Bridge Co	34
Shultz Belting Co	1
Stilwell-Bierce & Smith-Vaile Co	2
Stevens, F. B	36
Stuart Fire Brick Co	33
Sturtevant Co., B. F	1-25
Sykes Iron Roofing Co	34
Textor, O	2
Tod, Wm. & Co	34
Toledo Machine & Tool Co	35
Turner, Vaughn & Taylor Co	27
Union Mining Co	18
Upson Nut Co	1
Westinghouse Electric & Mfg. Co	29
Westinghouse, Church, Kerr & Co	23
Westinghouse Machine Co	27
Wood, Wm. H	22
Worthington, Henry R	22
Wellman Seaver Engineering Co	36

IRON AND STEEL MARKETS.

IRON ORE.

[On Lake Erie docks.]

Special low-phosphorus hard Ore, Bessemer	$3.40@ 3.46
No. 1 Specular, Bessemer	3.05@ 3.17
No. 1 Bessemer hematite	2.60@ 2.90
Hematites No. 1 non-Bessemer	2.00@ 2.25
No 1. Specular, non-Bessemer	2.40@ 2.60

PIG IRON.

CLEVELAND (f. o. b. cars):	
Bessemer	$ 9 65
No. 1 Strong Foundry	10 25@ 10 65
No. 2 Strong Foundry	9 65@ 10 15
No. 1 Gray Forge, red short	8 65
No. 2 Gray Forge, neutral	8 75
No. 1 American Scotch	10 40
No. 2 American Scotch	10 15
Lake Superior Charcoal	12 75@ 13 00
PITTSBURG:	
No. 1 Foundry	$10 25@ 10 50
No. 2 Foundry	9 25@ 9 65
Gray Forge	8 25@ 8 50
White and Mottled	8 50
Warm Blast Charcoal	14 50@ 15 00
Cold Blast Charcoal	17 00
Bessemer	9.40@ 9 50
CHICAGO:	
Lake Superior Charcoal	$13 00@$13 20
Local Coke Foundry No. 1	10 25@ 10 75
Local Coke Foundry No. 2	10 25@ 10 50
Local Coke Foundry No. 3	10 00@ 10 25
Local Scotch Foundry No. 1	10 50@ 10 75
Local Scotch Foundry No. 2	10 25@ 10 50
Local Scotch Foundry No. 3	10 00@ 10 25
Southern Coke No. 1	10 75@ 11 00
Southern Coke No. 2	9 85@ 10 10
Southern Coke No. 3	9 60@ 9 85
Southern No. 1 Soft	10 35@ 10 60
Southern No. 2 Soft	9 85@ 10 35
Southern Silveries	10 35@ 10 60
Jackson Co. Silveries	12 50@ 14 50
Ohio Silveries No. 1	@
Ohio Strong Softeners	12 00@ 12 25
Alabama Car Wheel	16 50@ 16 00
Malleable Bessemer	10 75@ 11 00
Coke Bessemer	11 50@ 12 00
CINCINNATI (reported by Rogers, Brown & Co.)	
Southern Coke No. 1, Foundry	$ $ 9 70
Southern Coke No. 2 and No. 1 Soft	9 50
Hanging Rock Coke, No 1	12 50@ 13 50
Hanging Rock Charcoal No. 1, Fdy	14 50@ 15 50
Tennessee Charcoal No 1	12 50@ 13 00
Jackson County Silvery No 1	12 50@ 13 00
Southern Coke, Gray Forge	8 00@ 8 25
" " Mottled	8 00
Standard Georgia Car Wheel	14 25@ 15 00
Tennessee " "	13 00@ 14 00
Lake Superior " "	14 75@ 15 25
BUFFALO:	
No. 1 Foundry Strong Coke Iron Lake Superior Ore	10 50
No. 2 Foundry Strong Coke Iron Lake Superior Ore	10 00
Ohio Strong Softener No. 1	10 50
Jackson Co. Silvery No. 1	14 00
Lake Superior Charcoal	14 00
Southern Soft No. 1	10 75
Hanging Rock Charcoal	17 00
ST. LOUIS:	
Southern Coke No 1	$ 9 50@$ 9 75
Southern Coke No. 2	9 00@ 9 25
Southern Coke No. 3	8 50@ 8 75
Southern Gray Forge	8 00@ 8 25
Southern Charcoal No. 1	13 00
Missouri Bessemer	12 00
Ohio Softeners	13 50
Lake Superior Car Wheel	14 50
Southern Car Wheel	14 50

OLD RAILS AND SCRAP METAL.

[Delivered Cleveland.]	GROSS TONS
Old iron rails	$12 00
Old steel rails (6 ft. and over)	10 00
Old steel rails (6 ft. and under)	9 00
Old car wheels	9 25
	NET TONS
No. 1 R. R. wrought scrap	$ 9 75
Mill scrap	7 25
No. 1 Machine cast scrap	8 00
Iron axles	13 25
Axle turnings	7 50
Wrought turnings (free from cast)	5 50
Cast borings	4 50
Uncut wrought iron boilers	3 50
Steel boiler plates	7 00
Grate bars	5 25
Pipes and flues (clean)	6 50
Tank iron	7 00
Hoop and band iron	5 00
Sheet iron	5 00
Wrought drillings	5 25
Malleable iron	8 50

STRUCTURAL MATERIAL.

Beams and Channels (f. o. b. Cleveland)	1.10c
Angles	1.05c
Tees	1.15c
Universal Plates	1.10@1.15c
Sheared Plates	1.15c

MERCHANT IRON AND STEEL.

[Less than car-lots, Cleveland.]

Rounds and Squares.—Bar Iron.

1 to 1⅞	1.00 Base
2 to 2⅞	.20 extra
3 to 3½	.50 "
3⅝ to 4	.80 "
4⅛ to 4⅝	1.00 "
4¾ to 5	1.30 "
5⅛ to 6	1.80 "
6¼ to 6½	2.20 "

PERFORATED METALS

OF ALL KINDS FOR

MILLING, MINING AND AGRICULTURAL MACHINERY.

Perforated Iron, Steel, Copper, Brass, Tin, Zinc, Lead, Etc., to Order.
Large and Varied Assortment of Sizes. Correspondence Solicited.

THE ROBERT AITCHISON PERFORATED METAL CO.,

Office, Room 510, 265 to 269 Dearborn St., CHICAGO, ILL. Works, So. Chicago.

..'96 JENKINS '96..

is the Perfection of Joint Packing. Instantaneous. Does not Squeeze Out and not Necessary to follow up Joint. We guarantee it to last for years on any and all pressures of steam or any kind of joint where packing is required. Does not Ret. Burn or Blow Out, therefore the best for all purposes. Call for and insist on having '96 JENKINS '96 stamped like cut.

Jenkins Bros., New York, Boston, Philadelphia Chicago.

The Iron Trade Review

Pays special attention to iron ore, blast furnace, rolling mill, foundry and machine shop interests. Per year **$3.00.**

THE JACKSON SAND MINING CO.,

JACKSON, O.

Producers of SILICA, FIRE and CORE SAND. Also MOLDING SAND for STEEL CASTINGS. Write for Prices.

Don't Waste Money in Your Pattern Shop.

THE GOBEILLE PATTERN CO., Cleveland.

Not every insertion of every advertiser's card brings an order for the advertiser's good; no more does every visit of the traveling salesman result in a sale.

There is a vast deal in familiarity with the type and phrase in which a manufacturer makes himself known to the advertisement reader, just as the personal acquaintance of his traveling salesman gets him a hearing when a strange face and a strange voice are bowed out with a " busy day's " courtesies.

The best advertisers, the most successful advertisers, the advertisers who get returns, are those who keep everlastingly at it.

This is a case in which familiarity breeds business.

IRON CLAD PAINT CO.

Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g.

CLEVELAND OHIO.

Trade Mark Patented.

ORDER DIRECT FROM THE

Iron Clad Paint Co.

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil

USED BY NEARLY ALL THE RAILROADS.

6¾ to 7¾	3.90 extra.
¾ to ⅞	.10 "
⅝ to 11-16	.20 "
½ to 9-16	.30 "
7-16 to 15-32	.40 "
⅜ to 13-32	.50 "
5-16 to 11-32	.70 "
¼ to 9-32	.90 "
7-32	1.40 "
3-16	2.50 "

Flats.—Bar Iron.

1¼ to 4 x ⅜ to 1	1.05 Base.
4¼ to 6 x ⅜ to 1	.10 extra.
6¼ to 8 x ⅜ to 1	.60 "
8¼ to 10 x ⅜ to 1	.80 "
1¼ to 4 x 1 1-16 to 1⅜	.30 "
4¼ to 6 x 1 1-16 to 1⅜	.40 "
6¼ to 8 x 1 1-16 to 1⅜	.60 "
8¼ to 10 x 1 1-16 to 1⅜	.90 "
2 to 4 x 1⅜ to 2	.50 "
4¼ to 6 x 1⅜ to 2	.60 "
6¼ to 8 x 1⅜ to 2	.80 "
8¼ to 10 x 1⅜ to 2	1.00 "
2 to 4 x 2⅛ to 3	.60 "
4¼ to 6 x 2⅛ to 3	.80 "
6¼ to 8 x 2⅛ to 3	1.00 "
1⅜ to 1¾ x ⅜ to 1	.10 "
1 to 1 1-16 x ⅜ to ⅝	.80 "
¼ to 15-16 x ⅜ to ¾	.40 "
⅝ to 11-16 x ⅜ to ⅞	.50 "
⅛ to 9-16 x ⅜ to ⅛	.90 "

Heavy Band Iron.

7 to 10 x ¼ to 5-16	.70 extra.
6¼ to 6¾ x ¼ to 5-16	.50 "
4¼ to 6 x ¼ to 5-16	.30 "
1⅜ to 4 x ¼ to 5-16	.20 "
1 to 1¾ x ¼ to 5-16	.30 "
¼ to 15-16 x ¼ to 5-16	.50 "
⅝ to 11-16 x ¼ to 5-16	.80 "
⅛ to 9-16 x ¼ to 5-16	1.00 "
⅜ to 7-16 x ¼ to 5-16	1.50 "

Heavy bands, 7-32 in. thick 1-10 c. per lb. higher than ¼ to 5-16 thick. **Bevel Edge Shaft Iron** 1-10 higher than same size of Heavy Bands.

Light Band Iron.

7 to 8 x No. 9 to 3-16	.90 extra
7 to 8 x Nos. 10, 11 and 12	1.00 "
6¼ to 6¾ x No. 9 to 3-16	.70 "
6¼ to 6¾ x Nos. 10, 11 and 12	.80 "
4¼ to 6 x No. 9 to 3-16	.50 "
4¼ to 6 x Nos. 10, 11 and 12	.60 "
1¾ to 4 x No. 9 to 3-16	.40 "
1¾ to 4 x Nos. 10, 11 and 12	.50 "
1 to 1 3-16 x No. 9 to 3-16	.50 "
1 to 1 3-16 x Nos. 10, 11 and 12	.60 "
13-16 to ⅞ x No. 9 to 3-16	.60 "
13-16 to ⅞ x Nos. 10, 11 and 12	.70 "
11-16 to ¾ x No. 9 to 3-16	.80 "
11-16 to ¾ x Nos. 10, 11 and 12	.90 "
9-16 to ⅝ x No. 9 to 3-16	1.00 "
9-16 to ⅝ x Nos. 10, 11 and 12	1.10 "
7-16 to ½ x No. 9 to 3-16	1.30 "
7-16 to ½ x Nos. 10, 11 and 12	1.40 "
⅜ x No. 9 to 3-16	1.50 "
⅜ x Nos. 10, 11 and 13	1.60 "

Bevel Edge Box Iron.

Same as Light Bands, of same sizes.

Beaded Band Iron, 1¼ in. to 2 in. .70

Sand Band Iron, 1-10 c. above same sizes of Light Bands.

Oval Iron.

⅜ to 1½	.40 extra.
¾ to 13-16	.50 "
⅝ to 11-16	.60 "
½ to 9-16	.80 "
⅜ to 7-16	1.10 "
½ to 9-16 x 3-16	1.00 "
⅝ to 11-16 x ⅜	1.20 "

Half Oval and Half Round.

2¾ to 3	.60 extra.
⅞ to 2	.50 "
¾ to 13-16	.70 "
⅝ to 11-16	.90 "
½ to 9-16	1.20 "
⅜ to 7-16	2.50 "
5-16	3.50 "
¼	4.50 "

Half Ovals less than ¼ their width in thickness, extra price.

Horse Shoe Iron.

All sizes 1 c. extra.

Cutting ordinary bars to specified length, .20 to .30 extra, according to length and size.

Steel Bands.

Width In Inches.	English Standard Gauge.		
1 1-2 to 6,	Nos. 7, 8, 9 or 3-16"	1.50	Base.
		Extras.	
1¾ to 6,	" 10, 11, 12 or ¼"	.05	per 100 lbs.
1 to 1¾,	" 7, 8, 9 or 3-16"	.10	"
1 to 1¾,	" 10, 11, 12 or ¼"	.15	"
13-16 and ⅞,	" 7, 8, 9 or 3-16"	.20	"
13-16 and ⅞,	" 10, 11, 12 or ¼"	.25	"
11-16 and ¾,	" 7, 8, 9 or 3-16"	.30	"
11-16 and ¾,	" 10 11, 12 or ¼"	.35	"
9-16 and ⅝,	" 7, 8, 9 or 3-16"	.40	"
9-16 and ⅝,	" 10. 11, 12 or ¼"	.45	"
½,	Nos. 7, 8, 9 or 3-16"	.55	"
½,	" 10, 11, 12 or ¼"	.60	"
7-16	" 7, 8, 9 or 3-16"	.75	"
7-19	" 10, 11, 12 or ¼"	.85	"
⅜,	" 7, 8, 9 or 3-16"	.95	"
⅜,	" 10, 11, 12 or ¼"	1.05	"

Iron and Steel Hoops.

Width in Inches.	English Standard Gauge.		
1 7-16 to 3	Nos. 13, 14, 15 and 16	1.60	Base
		Extras	
1 7-16 to 2,	" 17, 18, and 19	.05	per 100 lbs
1 7-16 to 2,	" 20	.10	"
1 7-16 to 2,	" 21	.15	
1 7-16 to 1¾,	" 22	.25	
1 ⅛ to 1¾,	" 13, 14 and 15	.05	
1⅛ to 1¾	" 16, 17 and 18	.10	

F. A. ESTEP, Pres. & Treas. J. R. McGINLEY, Vice Pres't. THOS. FAWCUS, Supt.

R. D. NUTTALL CO.,

99 BOQUET STREET, ALLEGHENY, PA.

ROLLING MILL,

BRIDGE, MINING,

HEAVY DUTY

GEARS AND PINIONS.

This is 4-inch Circular Pitch.

We Cut Involute, Epicycloidal or Special Teeth.

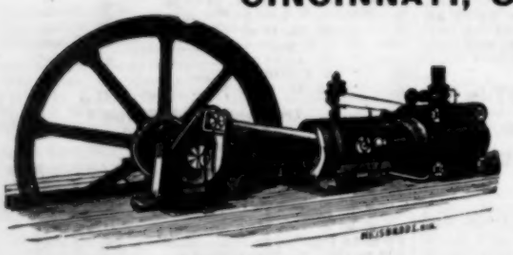
Spur, Bevel or Spiral Gears. Racks, Quadrants and Worm Gearing.

Persistence in Advertising

Is one of the requisites of satisfactory results. In the expansion of business which is confidently expected in the United States in the very near future, advertisers who have made themselves regularly prominent in the past two years will be first to reap the rewards of persistent publicity.

THE LANE & BODLEY CO.,

CINCINNATI, OHIO.



Engines,

ALL SIZES.

Simple and Compound.

Shafting, Hangers, Pulleys.

Belt Elevators, Saw Mills.

1⅛ to 1⅜,	"	19 and 20	.15 per 100 lbs.
1⅛ to 1⅜,	"	21	.20 "
1⅛ to 1⅜,	"	22	.30 "
15-16 and 1,	"	13, 14 and 15	.10 "
15-16 and 1,	"	16, 17 and 18	.15 "
15-16 and 1,	"	19 and 20	.20 "
15-16 and 1,	"	21	.25 "
15-16 and 1,	"	22	.35 "
⅞,	Nos. 13, 14 and 15		.20 "
⅞,	" 16, 17 and 18		.25 "
⅞,	" 19 and 20		.30 "
⅞,	" 21		.35 "
⅞,	" 22		.45 "
¾ and 13-16	Nos. 13, 14 and 15		.30 "
¾ and 13-16	" 16, 17 and 18		.35 "
¾ and 13-16	" 19 and 20		.40 "
¾ and 13-16	" 21		.45 "
¾ and 13-16	" 22		.50 "
¾ and 13-16	" 23		.60 "
11-16,	Nos. 13, 14 and 15		.35 "
11-16,	" 16, 17 and 18		.40 "
11-16,	" 19 and 20		.50 "
11-16,	" 21		.60 "
11-16,	" 22		.70 "
11-16,	" 23		.80 "
⅝,	Nos. 13, 14 and 15		.40 "
⅝,	" 16, 17 and 18		.45 "
⅝,	" 19 and 20		.55 "
⅝,	" 21		.65 "
⅝,	" 22		.75 "
⅝,	" 23		.85 "
9-16,	" 13, 14 and 15		.45 "
9-16,	" 16, 17 and 18		.50 "
9-16,	" 19 and 20		.60 "
9-16,	" 21		.70 "
9-16,	" 22		.80 "
9-16,	" 23		.90 "
½,	" 13, 14 and 15		.55 "
½,	" 16, 17 and 18		.60 "
½,	" 19 and 20		.70 "
½,	" 21		.80 "
½,	" 22		.90 "
½,	" 23		1.00 "
7-16,	" 13, 14 and 15		.80 "
7-16,	" 16, 17 and 18		.90 "
7-16,	" 19 and 20		1.00 "
⅜,	" 13, 14 and 15		1.00 "
⅜,	" 16, 17 and 18		1.10 "
⅜,	" 19 and 20		1.20 "

Sheet Iron.

No. 10	1 50
No. 12	1 70
No. 14	1 60
No. 15-17	1 75
No. 18	1 85
No. 20	2 00
No. 22-24	2
No. 25-26	2 20
No. 27	2 30

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

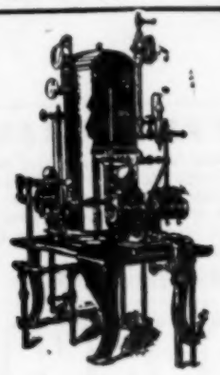
The Link-Belt Machinery Co.

ENGINEERS. FOUNDERS. MACHINISTS.

CHICAGO, U. S. A.

Modern Methods as applied to the handling of Iron Ore, Coal, Raw and Manufactured Products.

Manila Rope, Power Transmissions, Shafting, Pulleys, Shaft Bearings, Gearing Friction Clutches, etc.



IMPROVED DUPLEX SYSTEM

- - - FOR - - -

BURNING FUEL OIL.

Heats and cleans the oil and delivers it to the fires under high and uniform pressure.

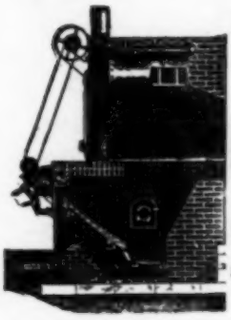
Entirely automatic, most scientific, sensible and economical method of burning oil in existence. If you are operating a Steel Works, Brass or Copper Rolling Mill, Malleable Iron Works, Bolt and Nut Works, Bicycle Works, or do Annealing, Forging, Brazing, Tempering, Japanning, Enameling, Case Hardening, you can use this machine to your advantage.

WE BUILD FURNACES OF ALL KINDS SATISFACTION GUARANTEED.

W. S. ROCKWELL & CO.,

26 CORTLANDT STREET, NEW YORK.

H. H. CAMPBELL.



Brightman Furnace Co.

648 Broadway, CLEVELAND, O.

SOLE MANUFACTURERS OF THE

Brightman Mechanical Stoker

FOR STEAM BOILERS.

THE MOST ECONOMICAL IN FUEL

and the Best Device in the World for Preventing Smoke.

Send for Catalogue "A."

STUART FIRE BRICK CO.

MANUFACTURERS OF

Silica Brick

For Open-Hearth, Basic and Acid Steel Furnaces, Glass and Copper Tank Furnaces. Extra Shapes MADE TO ORDER.

Office, Room 21, Conestoga Bldg., Cor. Wood and Water Sts., PITTSBURG, PA.

The Chicago & North-Western Railway

REACHING with its 7,966 miles of road the famous Water Powers, Coal Fields, Iron Ore Ranges, Hard and and Soft Lumber Districts located in Illinois, Wisconsin, Michigan, Iowa, Minnesota, South Dakota, North Dakota, Nebraska and Wyoming, and by traffic arrangements with other railways, 7,350 stations located on 41,000 miles of railroad (one-ninth of the entire railroad mileage of the world, and one-fourth of the railroad mileage of the United States), has on its line more industries than any other western railroad.

Manufacturers contemplating moving or establishing branch factories in the West are requested to inquire what we can offer them before locating elsewhere.

M. HUGHITT,
General Freight Agent,
CHICAGO.

Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 35
Shell	1 45
Flange	1 55
Marine Flange	1 60
Fire Box	2 05

Above includes plates 90 inches wide.

90 to 96 in. wide	⅛c. lb. extra
96 to 100 in. wide	1c. "
100 to 104 in. wide	1⅛c. "
104 to 106 in. wide	special.

Flats.	cts. lbs.
2 to 9-16 in. wide by 2 to ⅜ thick	.08

Bessemer and O. H. Steel.

Bessemer Machinery	base price,	1 40
Open-hearth Tire	"	1 45
Open-hearth Spring	"	1 80
Sleigh Shoe	"	1 45
Toe Calk	"	1 90
Cutter Shoes, tapered and bent	"	1 60

American Cast Tool Steel.

ROUND, SQUARE, AND OCTAGON.	cts. lbs.
1 to 2 in. inclusive	.06
9-16 to ⅞ in. "	.08
7-16 to ⅜ and 2⅜ to 3 in	.09
3⅛ to 4 in	.09⅜
⅝ to 11-16 and 4⅜	.10
1⅛ to 6 in	.10⅛
¾ to 9-32 and 6⅛ to 7 in	.11
1 in	.13

Burden Boiler Rivets.

⅛, ⅜, 11-16 and ¾ inches diameter	3 60
Bridge ⅛, ⅜, 11-16 and ¾ inch diam	2 55

Wrought Pipe and Boiler Tubes.

Lap weld black, base, four 10s	.62
Butt " " " four 10s	.62½
Lap " galv. " four 10s	.52½
Butt " " " four 10s	.50
Boiler tubes 2¼" and smaller	.70
Boiler tubes 2½" and larger	.75
Casting screw and socket joint	dis. 52½
Casing inserted joint	dis. 47½

MACHINERY SUPPLY MARKET.

[From Store, Cleveland.]

Anti-Friction Metals.

Magnolia Anti-Friction Metal, 25 cts. per lb., f. o. b. New York or Chicago.
No Name Metal, 18 cts. per lb., f. o. b. New York or Chicago.
Mystic Metal, 8 cts. per lb., f. o. b. New York or Chicago.

Anvils.

American	₩ lb 9@10
Wright's	₩ lb 12

Bellows.

Blacksmiths' Hill's	dis 40
Blacksmiths' Bullock's	dis 50&10
Moulders'	dis 40@40&10
Hand	dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 5 & 10
" " " extra	dis 60&10
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 50
Shultz Raw Hide Leather Belting, single	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.	dis 35

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 80
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis 33⅓
Horton's Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 45
Sweetland "	dis 40
Almond Drill	dis 40
Morse "	dis 20
Skinner's Combination Lathe	dis 40&15
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 30

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 10 to 15
Brown & Sharpe, Milling Cutters	dis 15
" " Gear Cutters	dis 15

Crowbars.

Cast Steel	₩ lb 3½
Iron, steel points	₩ lb 3

Drill and Drill Sockets.

Twist Drills	
Morse Taper & Straight Shank to 1¼"	dis 50 & 10 to 60
Morse Taper and Straight Shank Larger than 1¼"	
Drill Sockets	dis 25
Standard Twist Drills	dis 60@60&5
Cleveland " "	dis 60@60&5

Emery.

	No. 4 to No. 54 46 gr.	150 gr.	Flour, F. F
Kegs, ℔ lb	4½c	5 c	2½c
¼ kegs ℔ lb	4¾c	5¼c	2¾c
¼ kegs ℔ lb	5 c	5½c	3 c
10 lb cans, 10 in case	6 c	6¼c	5 c
10 lb cans less than 10	10 c	10 c	¼

Emery Cloth and Paper.

Barder, Adamson & Co. ..... dis 50@50&5
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Detroit ..... dis 60@70
Norton's ..... dis 60@70
Crant ..... dis 60@70
Sterling ..... dis 60@70
Celluloid ..... dis 10&33⅓
Northampton ..... dis 50
Crystal ..... dis 65@70
Vitrified ..... dis 60@70
Vulcanite ..... dis 60&10
Hamden ..... dis 60&10@70
Cyclone ..... dis 60@60&10

Files.

Arcade ..... dis 60&10@60&10&1
Nicholson ..... dis 60&10@60&10&1
" X. P ..... dis 2
Kearney & Foot ..... dis 60&10@60&10&1
Black Diamond ..... dis 60&10@60&10&1
McClellan ..... dis 60&10@60&10&1
Disston's ..... dis 65@70
Western ..... dis 70
Stub's ..... dis 25
Grobet's ..... dis 30
Reynolds Bros.' Hand Cut ..... dis 50
Industry File Works Hand Cut ..... dis 50

Hammers.

P. S. W ..... dis 4
Atha new list, Jan. 15, 1887 ..... dis 5
Heavy hammers and sledges under 5 lbs 1
" " " " over 5 lbs 8

Jack Screws.

Illinois Bolt Co. list ..... dis 7

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¼	4	3½	3⅛
Hexagon	15½	11⅛	8¼	6	5¼	5¼	
Washers	9	8	7	5	4½	4½	4⅛

In lots less than 100 lbs, ℔ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

Standard Penny Nails, ℔ keg, base.
Car lots $1 30
Less than car lots 1 40

Oilers.

Zinc and Tin ..... dis 6
Brass and Copper ..... dis 5
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ℔ doz ..... dis 10&10&1

Rivets.

Iron, Thousand, list November 1, 1894 ..... dis 60@65
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894 ..... dis 60@65
Copper ..... dis 50@50&1

Taps.

Cards, Hand and Nut to 2 in ..... dis 5
Carpenters' " " " ..... dis 5
Morse " " " ..... dis 5
Pratt & Whitney " " new list ..... dis 1
Machine Screw Taps ..... dis 5
Pipe Taps to 2½ in ..... dis 7
Stay Bolt Taps ..... dis 2
Stove Bolt Taps ..... dis 5
Pulley Taps ..... dis 4

Vises.

Solid Box ..... dis 6
Parker's ..... dis 20@2
Prentiss ..... dis 2
Stephen's ..... dis 25@3
Barrett's ..... dis 3
Miller's Falls ..... dis 4
Merrill's ..... dis 15@2
Howard ..... dis

Wire.

New List, Apr. 9, 189
Brass ..... dis 35
Copper ..... dis 35
Bright and annealed, Nos. 6@18 ..... dis 70&10&7
" " Nos. 19@26 ..... dis 75@75&
" " Nos. 27@36 ..... dis 75&10&
Coppered Nos. 0 to 18, market list ..... dis 70@70&
Galvanized Nos. 0 to 18 " " ..... dis65&
Tinned market Nos. 0 to 18 ..... dis 67½
Cast steel ..... dis 5
Tinned Broom Wire ..... dis 70&5@70&1
Annealed Fence, Nos. 8 and 9 ..... dis 75
Annealed Grape, Nos. 10 to 14 ..... dis 75
Stub's Steel Wire regular ..... 95c ℔ lb dis 3

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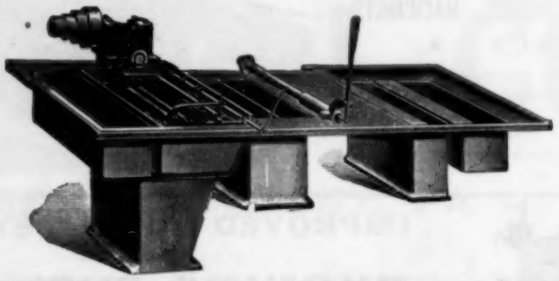

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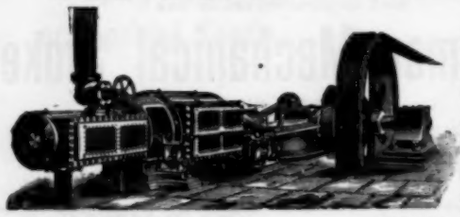

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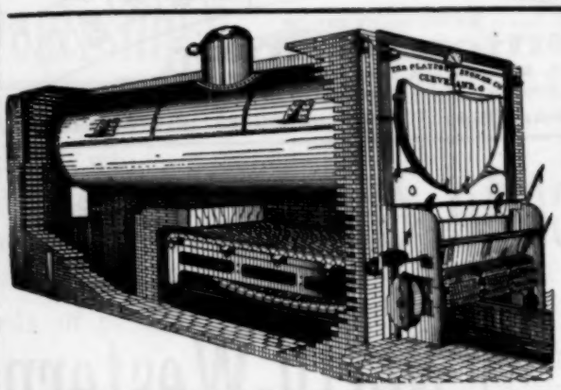

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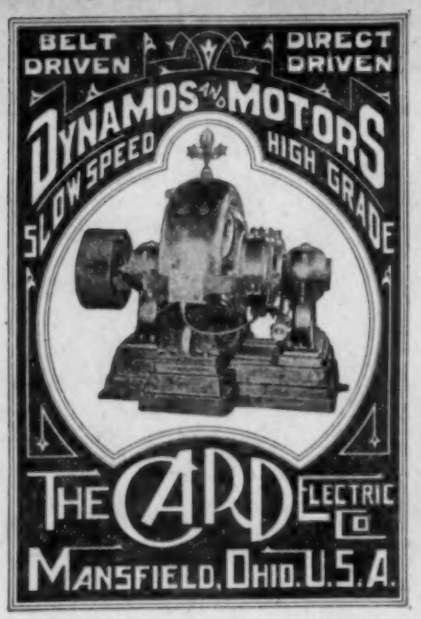

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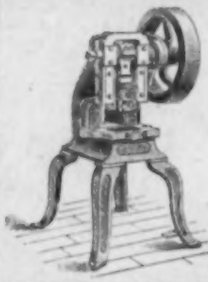
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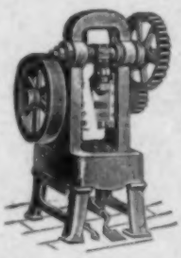
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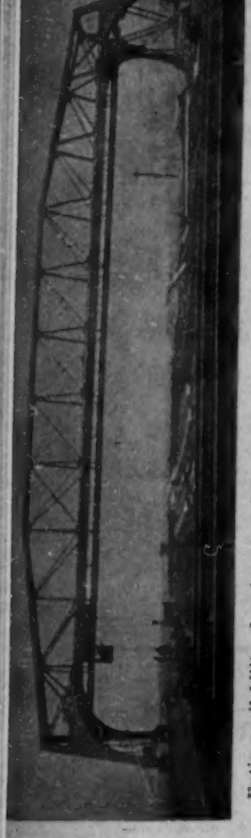

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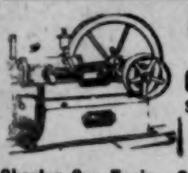

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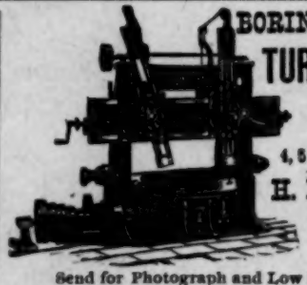

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